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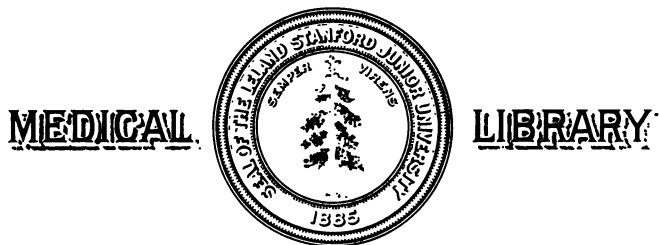
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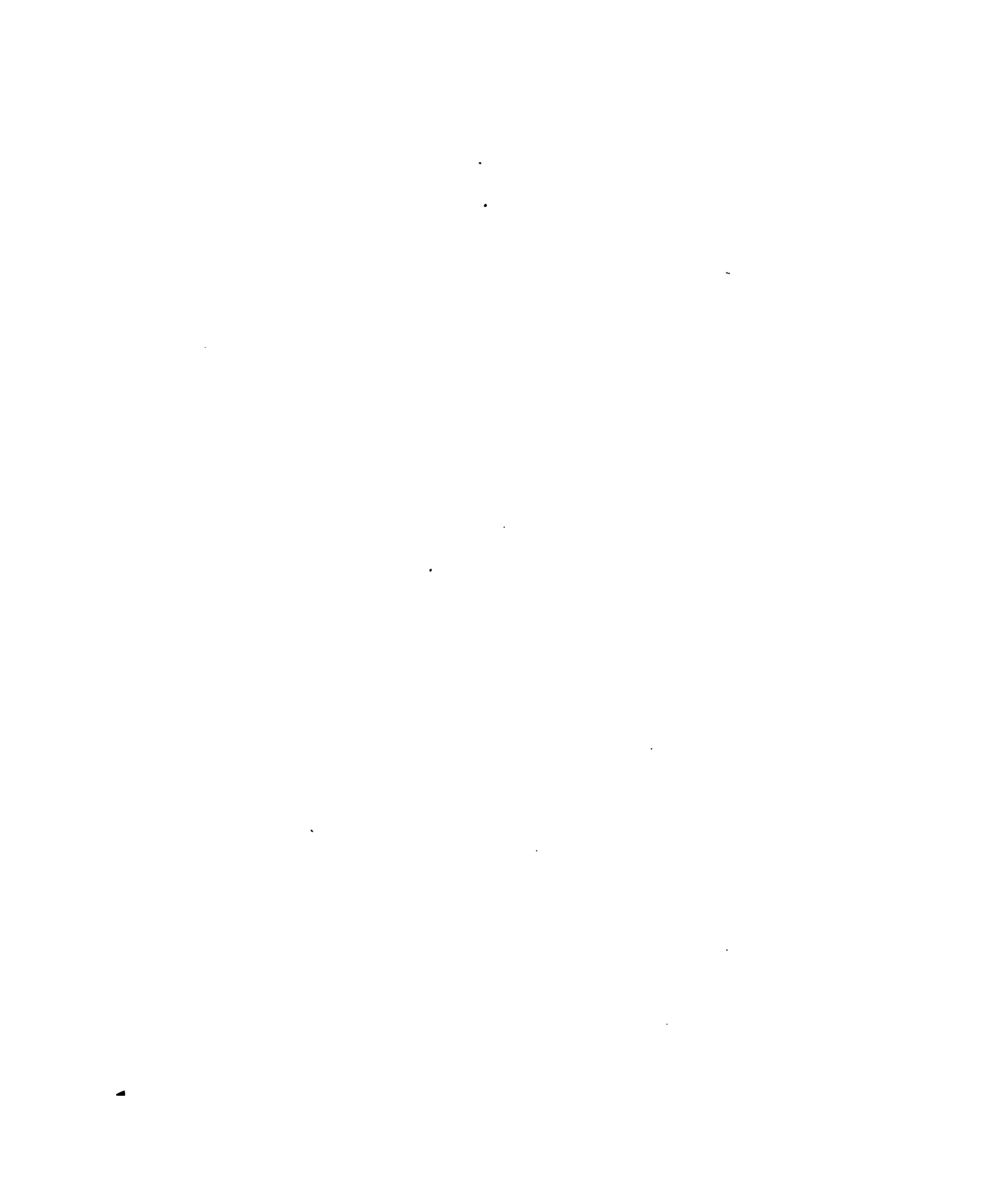
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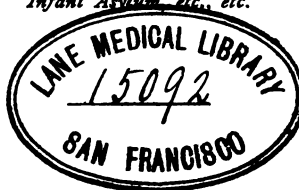
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CONTAGIOUS DISEASES OF THE EYE.

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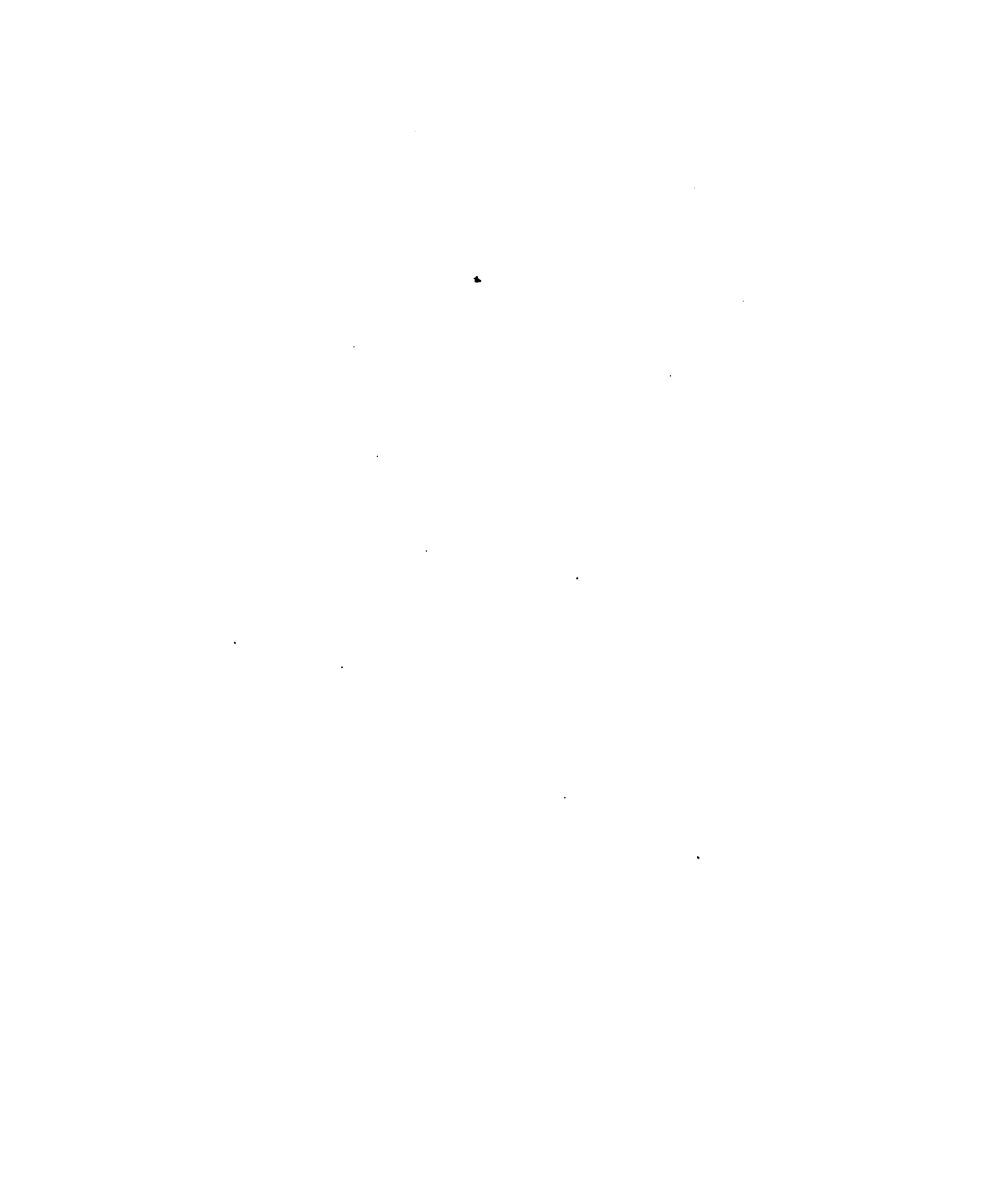
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168
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TABLE OF CONTENTS.

Methods of Examination and Means of Diagnosis, -	1
Anatomy of the Conjunctiva, - - - - -	9
Symptoms and Pathology of Conjunctivitis, - -	12
Causes of Conjunctivitis, - - - - -	57
Treatment of Conjunctivitis, - - - - -	76
Treatment of Acute Purulent Diseases of the Conjunctiva, - - - - -	76
Nature of Granular Lids, - - - - -	45
Treatment of Granular Lids, - - - - -	94



INTRODUCTION.

The importance of an early diagnosis of contagious diseases of the eye is so evident that it cannot be over estimated. The fact is, that thousands of children in our public institutions have been suffering from conjunctival affections when their existence was not known to the officers in charge, and in many instances not even to the attending physician. It is especially in the chronic forms of conjunctival troubles, the onset of which is often very insidious, that the disease is overlooked or not recognized until its ravages have crippled the patient for the remainder of his life. Milder attacks of conjunctival disease predispose at the same time to acute purulent affections which so often destroy the eye.

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Granular Lids and Contagious Diseases of the Eye.

METHODS OF EXAMINATION AND MEANS OF DIAGNOSIS.

In order to determine whether a patient suffering with a disease of the eye has conjunctival trouble or not, it becomes necessary to inspect the entire conjunctival sac, and to exclude all other inflammations, especially those that are apt to disturb the conjunctival circulation or to implicate the conjunctiva itself.

An examination of the conjunctiva of the eyeball is easily accomplished, especially if the patient is able to open the lids. If there is, however, dread of light, or if the patient's eye is irritable, or if the act of opening it is painful, a few drops of a weak solution of cocaine should be instilled into the conjunctival sac, which, in the course of a few minutes, will render the inspection of the eyeball easy and satisfactory.

If we find that the blood-vessels of the globe are enlarged and more numerous than in the healthy conjunctiva, and if this hyperæmia is uniformly distributed, or if it is more marked near the folds of transmission, and if there is at the same time evidence of increased secretion in the conjunctiva, or at the inner canthus, or on the free edge of the lid, the dis-

ease is probably a *catarrhal conjunctivitis*. If this form of hyperæmia is so marked as to give the eyeball a bright red appearance, the catarrh is, in all probability, that form known as *pink-eye*. Scales or crusts on the free edge of the lids, with partial loss of eye-lashes, would indicate that the conjunctivitis is in all probability due to an extension of the inflammation of the margin of the lids; such mild forms of conjunctivitis will disappear if the blepharitis marginalis is cured. A moderate amount of redness of the eye is almost uniformly found in tear sac troubles; pressure on the lachrymal sac should, therefore, be made in all doubtful cases, especially if one eye alone has suffered from conjunctivitis for some time.

Acute inflammatory swelling of the margin of the lid, especially if localized, indicates a hordeolum, and with this we must expect some participation of the conjunctiva; in fact, if a sty develops near the outer corner, it is apt to be accompanied by intense redness of the eye, and the conjunctiva of the eyeball may be swollen or lifted by serous exudation to such an extent, that it resembles bags of transparent fluid. The patient is hardly able to open the lids in such cases, and an inspection of the eyeball becomes very difficult. The pain is, however, more intense and of a sharp, acute variety and differs in that respect from the painful sensation of an acute conjunctivitis.

Localized injection of the eyeball is sometimes due to a slight injury. If a number of congested ves-

sels are arranged ~~in a leash~~, and run in a direction away from the cornea and ~~toward~~ the equator of the eyeball; and if there is at the point of ~~the~~ leash, near or on the cornea, a small semi-transparent vesicle, or a slight ulcer with thickened margin, the disease is probably a *phlyctenular conjunctivitis*, which is not contagious. A fine rosy injection around and radiating from the cornea, the vessels being small, deep-seated, and not movable like those of the conjunctiva, may indicate disease of the cornea, or an inflammation of the iris, or of the ciliary body. That of the latter is rare. The congestion accompanying it is usually localized but acute, and the inflamed spot is exquisitely tender on pressure. In iritis the congestion is circum-corneal and generally quite intense. There is much deep-seated pain in the eye, followed early in the disease by radiating attacks of pain of the entire side of the head; the iris is dull and discolored; the pupil is immovable, and the vision of the patient is impaired. In affections of the cornea there is roughness of the surface, or some opacity of this part of the eye, and frequently change of its lustre. It must not be forgotten, however, that in severe types of inflammation of these parts, there is frequently an extension of the ciliary injection to the conjunctiva, which may become so intensely red in appearance that the diagnosis is very difficult; especially is this the case in iritis, and a drop of atropine solution may have to be instilled into the eye. If this is followed by an irreg-

ular dilation of the pupil, it indicates the existence of an iritis. The differential diagnosis of keratitis is easier; opacities of the cornea being readily recognized.

The nature of the discharge of an inflamed eye is also of diagnostic importance. A foreign body, for instance, may become lodged in the cornea, or the conjunctiva of the eyeball, or, what is of more frequent occurrence, under the lids, especially the upper one. Such an eye will appear very much inflamed; there is great dread of light, and the patient is afraid to open his eye. There is, besides, abundant discharge, and more or less pain in these cases; but the discharge consists almost entirely of tear-fluid, and the pain varies from acute sharp stings, especially if the eye is suddenly exposed to the light, to a peculiar gritty sensation, the seat of which appears to be under the upper lid. Mistakes in diagnosis in regard to the irritation caused by foreign bodies are so frequently made, that it must not be forgotten to look for their presence on the cornea and under the upper lid every time an actually inflamed or irritated eye is presented to us for examination. A few drops of cocaine will not only aid in the removal of these intruders, but will be of great service in examining the irritable eyes of such patients. Before the days of cocaine an anæsthetic had frequently to be administered to make an examination of such eyes possible, and not only in children was this necessary, but even in otherwise strong and robust men.

The presence of mucoid matter in the conjunctival sac is a sign of catarrhal conjunctivitis, but that of pus is a grave indication. However, in the very beginning of the more serious inflammations it may be absent; but there is generally a speedy development of other inflammatory signs and early implication of the lids. The smoothness of the conjunctiva is also a matter of great importance; it is only slightly changed in simple catarrhal conjunctivitis by the enlargement of the bloodvessels, or the swelling of the papillary layer of the conjunctiva, which gives it the appearance as if small grains of sand had been dusted over it. Larger bodies of the size of bird-gravel are signs of *granular conjunctivitis*; they are especially large and numerous in the follicular variety. Rough velvety irregularities of the epithelial layer of the conjunctiva, of a rich red color, are signs of *blennorrhœa* or *purulent inflammation*. Whitish or yellowish plaques or bands of cicatricial nature, especially near the fold of trans-mission, are found during the latter stages of *trachoma* or granular lids. Larger granulations of a polypoid nature are sometimes found under the lids in connection with cystitis of the Meibomian glands.

Most of these formations become visible only after everting the lids. This is not always an easy task, especially if the eyes are painful and irritable, or when children's eyes are to be examined. The conjunctiva of the entire lower lid is easily exposed by gentle downward traction, while the pa-

tient is looking in an upward direction, the lid is readily everted and its conjunctival side exposed for inspection. The eversion of the upper lid in a thorough and satisfactory manner requires, however, a certain amount of skill and may become, as mentioned before, a matter of great difficulty in children and very nervous persons. It is important not to alarm the patient beforehand and not to hurt him during the procedure. A probe or pencil may be necessary for one who is not accustomed to evert lids; but these articles are apt to impress the patient with the idea that some operation is to be performed on his eyes, which has the tendency to make him nervous. We must likewise remember that it is almost impossible to evert the upper lid if the patient draws the skin of the forehead into folds, or if he should look upwards. The first motion is prevented by firm pressure of the thumb of the operator upon the eye-brows; the second by telling the patient to look downwards. The more resistance the patient offers, the more difficult is the eversion of the lid.

In order to evert the upper lid, tell the patient to look down, place the fingers of the left hand upon the forehead and the thumb of the same hand gently but firmly upon the brow, seize the lashes of the upper lid by means of the fingers of the right hand, without, however, making much traction, caution the patient to look down to the floor, and let the left thumb push the brow gently but firmly downward and backward,

lifting at the same time the free edge of the lid by means of the lashes. In order to expose the upper cul-de-sac very thoroughly, which is absolutely necessary in the case of granular lids, not only in order to make a diagnosis but also to make topical applications the patient must be told repeatedly and urgently to look down before him, and the everted margin of the lid must be pushed back under the brow. As soon as the lid is turned over the thumb is of course removed and employed to hold the lid in the everted position by pressing the margin against the brow. If the lid is without lashes, very short or very rebellious, it may be pushed back over the left thumb by means of a towel instead of lifting it by the eye-lashes. For this purpose wrap around the thumb of the right hand a single thickness of a handkerchief or towel or a small piece of muslin, place it against the free edge of the lid and push it upward while the left thumb presses down the brow. The muslin prevents the lid from slipping away.

In using a probe or penholder for turning the upper lid, the lashes of the lid are pulled in a downward direction and after pressing a probe firmly against the lid, this is lifted upward and the probe is withdrawn. If the palpebral fissure is very large and the lids long, the upper lid may be everted by means of one hand alone.

In infants pressure over the lids near the outer canthus may suffice to turn both lids at once; this is

especially easy if the little patient is crying vigorously. If the outer canthus is sore and fissured, as it is apt to be in strumous children, traction at the point, which would be apt to tear the fissure open, should be avoided; and such eyes should be opened by traction made at the inner canthus.

ANATOMY OF THE CONJUNCTIVA.

Before going into the history of contagious diseases of the conjunctiva, it will be necessary to give a brief sketch of the healthy appearance of this mucous membrane which extends from the margin of the cornea to the free edge of the lids and which, as its name implies, joins the lids and the eyeball. It is, therefore to be divided into the conjunctiva of the lids or the tarsal portion, that of the eyeball or bulbar conjunctiva, and the part which forms the junction of these two. It has been named cul-de-sac or folds of transmission, or the fornix, or retro-bulbar folds. This last-named portion is found above where it connects the conjunctiva of the upper lid and that of the eyeball and below where it joins in a similar manner the lower lid with the globe. This leads to the formation of two pouches; one above, known as the upper cul-de-sac, and one below, the lower cul-de-sac. It is especially here where the conjunctiva differs materially from the rest of the eye, where disease is apt to occur, and where the pathological changes are most pronounced. It is here where we have to look for the first and last signs of contagious ophthalmia, and no examination of an eye for such a disease can be of any value unless the lids have been thoroughly everted and the cul-de-sacs completely exposed for examination.

The conjunctiva is almost transparent and differs in appearance according to the underlying parts; that of the eyeball appears white, because this is the color of the sclera which it crosses: that of the lids is somewhat yellowish, for beneath it is the dense fibrous tissue of the lids, known as the tarsal cartilage; the bluish lines that are seen here indicate the position of the Meibomian glands. At the folds of transmission it changes in appearance from a slight pink to a bright red on account of the large number of bloodvessles at this point.

At the inner corner of the eye we find another fold of the conjunctiva; it is reflected backwards upon the globe; it varies in size in different persons and is the rudiment of a third eyelid; it is more developed in birds and is called *membrana nictitans* or the semi-lunar folds. Still nearer to the inner canthus is the caruncle. The conjunctiva does not end at the margin of the cornea; its outer layer extends some distance over the periphery of it, and is called the *limbus*; the more superficial layers of the conjunctival epithelium extend even over the entire surface of the cornea. The *limbus* differs slightly from the rest of the conjunctiva, for its fibres are radiating and dense.

The conjunctiva consists of different layers; it has a basement structure, composed of connective tissue fibres, which are more or less elastic; an epithelial covering and underneath is the subconjunctival tissue. The epithelium is arranged in layers of

cells and forms, especially at the upper fold of transmission, convolutions and fissures, arranged in a very intricate manner. The cells are more or less conical in shape at the palpebral folds, but become flatter as they approach the margin of the cornea or the free edge of the lid.

In order to facilitate the movements of the lids over the eyeball the conjunctiva has to be not only smooth, but must be kept constantly moist. The tear-fluid does not fulfil this office sufficiently and most of the secretion necessary for this purpose is derived from glandular structures of the conjunctiva. The most important ones are found in the fold of transmission and near the upper portion of the eyelid, they are called the glands of Krause and belong to the acino-tubular glands. Mucous follicles are abundantly supplied. Extensive destructive changes of the conjunctiva are therefore apt to leave the eye perfectly dry, a condition called xerophthalmus. The removal of the lachrymal gland, however, causes hardly any changes in the moisture of the conjunctiva.

SYMPTOMS AND PATHOLOGY OF CONJUNCTIVITIS.

The first symptom in all conjunctival affections is hyperæmia of the larger conjunctival vessels; this may affect only the palpebral portion of it, or may extend to the bulbar conjunctiva. In the former the appearance of the eye is not much changed, and only on everting the lids their unusual redness becomes apparent. The patient will complain about a full, heavy sensation of the lids, which may in many instances manifest itself in the form of sleepiness, especially if the eye is used for small objects. Very often the congested vessels, by causing an unevenness of the otherwise smooth conjunctiva, will, by rubbing over the cornea or the eyeball, produce a gritty and rough sensation, which may resemble the irritation caused by the entrance of sand or other small particles of dust into the eye. Patients will frequently call upon the physician with the statement that they feel there must be something in the eye, when the trouble is due to the congested condition of the conjunctival vessels. In nearly all these cases the redness is more decided at the upper or lower cul-de-sac; but it must not be forgotten that the entrance of a foreign body is frequently followed by a general hyperæmia of the conjunctiva, and only the absence of such a foreign substance should settle the diagnosis.

In some cases the redness extends to the eyeball very early; for instance, in that form of conjunctivitis known as Pink-eye; it may be present at the beginning of the disease. However, its early appearance on the eyeball should, as a rule, be looked upon with suspicion, for the severer forms of conjunctival disease are ushered in in this way. However, it is not possible to diagnose the nature of the coming disease at this stage; as the redness may disappear as rapidly as it came. I have often seen it very marked on slight provocations in old people or in habitual drinkers and in conjunction with exanthematous diseases it loses much of its clinical importance. The presence of marginal inflammations of the lids, such as blepharadenitis may account for a good deal of redness of the conjunctiva and especially a simple affection like a hordeolum (stye) may by retarding the venous circulation produce not only much conjunctival injection, but a good deal of serous infiltration of the conjunctiva and even of the lids; but this is apt to be local; confined to one portion of one eye only. Marked injection of the entire conjunctiva, however, accompanied by serous infiltration of the lids and a red or dusky appearance of the integument of the lids, is usually the forerunner of severe disease of the conjunctiva. In many instances this is followed by marked rise of the local temperature, which is felt by the patient as well as by the physician, and which may mislead both to suspect an attack of erysipelas. In fact, a

slight general rise of temperature is often met with under these circumstances, but the fever is not apt to be nearly as high as that accompanying erysipelas; the stationary character of the swelling would also speak against this affection. A very rapid onset of the trouble with marked general disturbances, especially if the right eye is attacked, should make us suspect the approach of gonorrhoeal ophthalmia. Redness of the eyeball, however, which is especially marked around the border of the cornea, is one of the first signs of iritis or keratitis; these affections may be so masked by the participation of the conjunctiva, that their existence is not suspected and the patient is often subjected to erroneous treatment and may lose his sight on account of this mistake. If such a peculiar redness of the eyeball is present, associated with more or less pain, and absence of discharge, so that the eyelids are not glued together in the morning, this is in all probability a circumcorneal or ciliary injection, a symptom of iritis or keratitis.

After the stage of congestion has lasted for a few hours, in some cases more than twenty-four or forty-eight, the stage of effusion sets in, which in the beginning is serous. If it finds its way into the sub-conjunctival layers of the eyeball, it gives rise to a condition named chemosis, and may resemble in these cases semi-transparent water-bags. Frequently the redness of the conjunctiva is so marked that very little of the transparency can be observed. In some cases the conjunctiva

is almost normal in its appearance and the fluid gives the swollen conjunctiva a tawny-yellow color. There is, as a rule, very little pain in spite of the rapidity of the attack. It is mostly in poorly fed individuals or in weak, lymphatic children that the disease assumes this form, and is then spoken of as *œdematous conjunctivitis*. The lids are usually more or less swollen, and the patient is often not able to open his eyes; but the absence of local heat and marked congestion will facilitate the diagnosis. Gentle pressure upon the lids will reduce the swelling for the time being, so that the eye is easily opened for inspection. In the course of a few days the effusion is apt to vanish and even without treatment the normal condition will be restored. The trouble is more alarming than serious.

Catarrhal Conjunctivitis.—The hyperæmia of the conjunctiva is soon followed by a secretion of an albumino-mucoid condition. It forms a discharge which is principally composed of tear-fluid, mixed with the mucoid secretion of the conjunctival glands, serous effusion, many epithelial cells, and later, some pus corpuscles. Severer cases are associated with a more or less febrile condition and redness as well as local heat of the lids. The discharge will evaporate during the night and the lids become firmly glued together, requiring careful bathing in tepid water before they can be opened. If the swelling of the lids, especially of the upper one, is marked, the patient is not able to open the eyes, and on everting the lids the upper fold

of transmission presents itself as a red, fleshy swelling (*Schwellung's Catarrh*). Certain epidemics are characterized by the appearance of small vesicles near the corneal margin; their number may vary from two or three to twenty or more. The vesicles are formed by the lifting up of the swollen epithelial layer of the conjunctiva, and resemble in appearance herpes pustules, as we are apt to see them on or near the lips; they resemble also phlyctenular vesicles, but differ from them because they are not apt to break; nor have they the indurated base, which is so well marked in most phlyctenular formations; they will generally disappear in a few days. This form of the disease is known as a *pustular catarrh*, but does not differ much from that of a moderately severe attack of conjunctivitis.

A very protracted form of catarrh is characterized by marked hypertrophy and vascularity of the limbus; this may be partial, but it sometimes affects the entire limbus, and appears like a faint vascular swelling around the cornea. It is generally found in attacks occurring in spring or fall; they are often spoken of as *vernal or autumnal catarrh*.

In older or debilitated persons a catarrhal inflammation, especially if associated with marked injection of the bulbar conjunctiva and participation of the limbus, is apt to be followed by marginal ulcerations of the cornea. These narrow, but sometimes very extensive ulcers are apt to be overlooked, because the

swollen limbus covers them, and they will thus spread in depth and extent until the entire cornea is in danger. Sometimes small abscesses resembling whitish spots and being more or less numerous, make their appearance. They are generally in the peripheral portion of the cornea, are nearly round, of the size of a head of a pin, or a little larger, and give the eye a very peculiar appearance, the more so because the conjunctival redness is increased by some ciliary injection. In children ulcers of the cornea are not so frequent, but they may occur, and are then more rapid in their development and more destructive.

This discharge of catarrhal conjunctivitis, especially of the severer forms, is contagious, and strict attention should be paid to prevent the disease from spreading to other members of the family, or to other inmates of an institution, especially if the place is crowded.

The principal *objective symptoms* of the disease, when fully developed, are:

1. Marked hyperæmia of the tarsal and often, also, of the bulbar conjunctiva. However, on evert-
ing the lids, the Meibomian glands are more or less visible through the semi-transparent conjunctiva in all milder cases, and the single blood-vessels are distinctly visible on the lids as well as on the eyeball.

2. Small hæmorrhages from the engorged vessels are of frequent occurrence; they are very charac-

teristic of catarrhal conjunctivitis; they are principally found in the bulbar conjunctiva, and vary considerably both in size and number.

3. The loss of epithelial cells and the swelling of the papillary layer of the conjunctiva are not so marked as to change its smooth appearance, except in some subacute or chronic cases, where the conjunctiva of the lids looks as if fine sand had been thrown over it.

4. The discharge is viscid, and contains little pus but many epithelial cells, and is more or less flocculent.

5. The discharge cannot pass through the canaliculi; it will flow over the edge of the lids, where it evaporates, giving rise to the formation of yellow crusts; it will also cause redness and excoriations of the lids and face.

6. The outer as well as the inner corner of the eye is especially red, and excoriated and painful fissures may form at the outer canthus.

7. The lids are not only red and swollen so that the patient is not able to open the eyes, but there is at times some blepharospasm. The Meibomian glands are more or less affected, their secretion changed and increased; this may give rise to a mild form of blepharadenitis.

The subjective symptoms are especially annoying, and, although there is not much severe pain, yet the disturbance of vision and the inability to open the

eyes may oblige the patient to keep to his bed. His principal complaints are apt to be:

1. A sensation as if a foreign body had got into the eye; this is especially felt under the upper lid; a rough, gritty sensation is often mentioned.

2. The patient is not able to open the eyes in the morning; partly because they are glued together by the evaporation of the discharge, partly the act itself is painful, and partly because he dreads the light.

3. There is some photophobia. Bright sunlight as well as bright artificial light is not only painful, but it is apt to increase the hot, burning sensation of the eye.

4. All the symptoms are more marked in the evening, especially when the eye is exposed to artificial light. This is the reverse of phlyctenular conjunctivitis, which is more troublesome in the morning.

5. The lids feel hot and itchy; this is partly due to the formation of crusts upon them, and is apt to be increased by the patient rubbing them.

6. The vision is disturbed, and the patient is apt to be greatly alarmed about it. This is, however, not due to an actual impairment of vision; it is caused by the secretion of mucus which is apt to cover the cornea. If the patient looks at a light, it will be greatly changed by radiating rays or by fiery and col-

ored rings around the flame. These symptoms will, however, disappear, if the eye is carefully cleaned.

7. There is some pain, especially in the beginning; it is of a burning, smarting nature, and does not extend to the supra- or infra-orbital nerves, like that of iritis or keratitis; it is more confined to the eye and lids, and does not last longer than two or three days in some cases, and perhaps only for a few hours during the first night of the attack.

These symptoms vary considerably according to the severity of the case, but they are generally present in all cases.

The duration of a catarrhal inflammation of the conjunctiva varies considerably. Milder cases will get well in two or three days; severer attacks will disable the patient for several weeks. The former may get well without medication; the latter may require energetic and continuous treatment for weeks. The greatest danger in milder attacks is their tendency to become chronic. This is especially the case in old or debilitated subjects, or in persons of intemperate habits. Severer forms of the disease are apt to run into real purulent ophthalmia, or, assuming a chronic type, may become chronic blenorrhœic conjunctivitis, and as such are liable to lead ultimately to granular lids. It is for this reason that acute catarrhal conjunctivitis, occurring in localities where many inmates are crowded together, should be as carefully managed as the most violent purulent and contagious diseases

of the conjunctiva, and above all, such patients should be as strictly quarantined as these. In fact, a simple catarrhal conjunctivitis may, at any time, on account of irritating applications, of exposure or through other debilitating causes, develop into purulent ophthalmia.

Purulent conjunctivitis is to be divided into four subdivisions; these are iodopathic purulent ophthalmia, or blenorrhœal conjunctivitis, blenorrhœa neonatorum, gonorrhœal ophthalmia and acute granular or Egyptian ophthalmia, or military ophthalmia.

It is often impossible to draw a line of demarcation between a severe attack of catarrhal conjunctivitis and a mild form of purulent ophthalmia, but it is still more difficult to tell from the mere appearance of a badly inflamed conjunctiva whether the patient is suffering from gonorrhœal conjunctivitis or any other purulent blennorrhœic disease. The early signs of these purulent diseases are exactly like those of an ordinary cold of the eye, but they soon differ from such by the intensity of the conjunctival injection and the early participation of the conjunctiva of the eyeball as well as by the œdematous infiltration of the lids. Even the orbital vessels, especially the veins, are apt to be markedly congested and this may lead to a certain prominence of the eyeball, resembling true exophthalmos. The secretion of the partly implicated Meibomian glands is increased and it, as well as some of the conjunctival discharge, evaporates

readily on account of the increase of the local temperature of the lids and glues the latter more or less firmly together. The secretion of the conjunctiva cannot escape; it is retained in the eye and acts as a new irritant to the already inflamed conjunctiva. On opening the lids forcibly the penned-up discharge escapes sometimes with a spurt, throwing particles of the secretion some distance; and it is not rare at all that the contagious discharge gets in this manner into the eye of the physician or the nurse. This is apt to be the case during the first twenty-four or thirty-six hours when the discharge consists of this sero-pus and is quite fluid; later when it changes to a thick, creamy consistency this source of danger is not so great, because the thick matter cannot be thrown any great distance, but now flows gently down the cheek.

This form of inflammation is not confined to the epithelial and papillary layers of the conjunctiva, but extends soon to the deeper part and to the subconjunctival tissue. The injection becomes intense in character; the single vessels are no longer discernable; the whole conjunctiva assumes a deep red appearance and the Meibomian glands are not visible on eversion of the lids. There is an early and marked loss of epithelial cells and this gives the conjunctiva a rough, velvety look. Chemosis is almost universally found, but it differs very much from that of some catarrhal affections; there is no semi-transparent, baggy appearance: the eyeball seems to be covered by heavy

fleshy masses and the cornea appears more or less sunken on this account. The folds of transmission, especially that of the upper lid, is swollen and the semi-lunar fold as well as the caruncle are red and enlarged. The lids are somewhat œdematous early in the beginning, and the upper one soon becomes so enlarged that it cannot be kept open; it is apt to overlap the lower one like a thick heavy fold, hiding the lashes of it completely. Later the heat and swelling of the lids becomes very marked; the integument becomes red, glistening, and the entire lid is puffy. Gentle pressure of the finger leaves a marked indentation. In the beginning the swelling can be temporarily scattered by gentle pressure, but later this is not possible. The discharge, which at first consists principally of tears, changes and is now more mucopurulent; masses of epithelial cells form flocculi in it, and within twenty-four hours more abundant admixture of pus corpuscles can be observed by means of the microscope. These latter rapidly increase in number as the disease advances until the secretion becomes of a thick, creamy consistency, which, upon lifting the upper lid, is apt to flow over the cheek. The discharge has now become more abundant; it is remarkable what an amount of pus such a small mucous membrane as that of the eye is, can produce. Every few minutes the conjunctival sac seems to become filled with it. In fact the entire conjunctiva seems to be saturated with it and presents on this ac-

count at times a grayish instead of a dark red appearance. In severe cases the secretion becomes semiplastic and covers the inflamed conjunctiva like a delicate gray membrane, which, however, is not adherent to the tissues; it can be wiped off quite readily by means of a piece of linen, and differs in this respect from the croupous and still more so from the diphtheritic conjunctivitis. The process of cleaning the eye, especially that of everting the lids, becomes painful on account of their swollen condition and the loss of epithelium, together with the intense hyperæmia of the parts, makes slight hemorrhage the rule and the discharge is frequently of a somewhat pinkish color on this account, especially after disturbing the lids. These small hemorrhages need not alarm us, however, for they lead to a partial depletion of the engorged vessels; they should be controlled, however, before applications are made to the eye, as the blood is apt to prevent the medicines from coming in contact with the diseased tissues.

Corneal Complications.—The pain that the patient complains of in the beginning is apt to subside as soon as a copious purulent discharge shows itself; should it, however, reappear later, say four or five days after the onset of the disease, it should induce us to make a careful examination of the cornea; it means as a rule that an infiltration of some portion of the cornea or more frequently that a marginal slough of this part of the eye has taken place. If it continues

to increase in severity and becomes of hemicranial character the purulent process may have extended even to the iris or to the choroid and the disease is liable to lead to a general purulent inflammation, and in such a case necessarily to the loss of the eye. This latter condition is by no means rare in very acute purulent affections, but corneal complications are decidedly more frequent. In panophthalmitis we have not only intense, almost unbearable pain, but there is always more or less general disturbance and not unfrequently delirium. Meningitis or metastatic cerebral abscess may even lead to a termination of the trouble by the death of the patient. The cornea is so apt to suffer because the densely infiltrated and therefore heavy fold of the conjunctiva of the eyeball are apt to overlap its border and thus by compressing the anterior ciliary vessels lead to a disturbance of its nutrition. But this is not the only reason; there may be only little swelling of the conjunctiva or limbus, but there may be much deep-seated semi-plastic infiltration, which by its presence or its contraction interferes with the circulation of the ciliary vessels sufficiently to endanger the health of the cornea. In other cases the germs of infection may enter the cornea through its lymph channels, and in such instances there is a distinct hazy encroachment in the shape of a delicate striae, starting from the periphery toward the centre of the cornea, to be observed. The cells of the cornea are invaded by the microbe

to such an extent that it **breaks** down. The ulceration progressing in some instances so rapidly that the entire cornea may be destroyed in twenty-four hours. As a rule the damage to the cornea is not so great and especially if pressure is the cause, for in such cases there are generally some vessels remaining free from it, which help to keep up enough tone of the cornea to prevent it from breaking down so rapidly. Marginal ulcers of the cornea are more apt to occur if the pressure over the ciliary vessels is great; infiltration of the entire cornea or parts of it are probably caused by migration and invasion of infective germs; if only some of the lymphatic channels are invaded by them, localized infiltration will be the result. We may find only a small peripheral or central infiltration of the cornea, and these may be absorbed again, if the morbid process has come to a standstill, or if the surrounding tissues have vitality enough to withstand the attack of the micrococci. The infiltration masses may, however, by their presence interfere with the nutrition of the surrounding clear tissue sufficiently to cause it to break down, an ulcer is thus formed, sometimes in the centre of the cornea, the rest of the organ remaining unaffected. A deep ulcer in the central region is always a serious complication and even if it does not perforate the entire thickness of the cornea, it is apt to leave such a dense cicatrix that vision is more or less impossible and that an iridectomy may have to be made after the

disease has run its course in order to restore the sight. The only difference between such an ulcer and one that leads to perforation of the cornea is this: the latter necessitates the making of an iridectomy for the preservation of the eye, whereas, in the former an iridectomy may be made in order to give the patient a little better vision.

During the progress of the corneal ulceration the entire cornea may become involved, presenting in such a case a uniform gray surface with masses and strings of mucus, mixed with pus, and debris of the broken down tissue hanging to it. The hopelessness of the case is apparent and the patient has now only perception of light, when unexpectedly, at the next visit, the physician is agreeably surprised to find instead of a gray, soft, pulpy cornea, one of peculiar brilliancy and great transparency; the patient is likewise pleased for he can see all the large objects of his surroundings; but unfortunately this delusion is only of short duration. The corneal tissue proper has entirely disappeared and what we see now is the clear and highly refractive membrane of Descemet. In very rare instances, and only if the ulcer is small, will this membrane be able to withstand the intra-ocular pressure and cicatrization may in such a case begin at once; as a rule, however, it will give way within twenty-four hours from this visit, and with it will the vision of the patient disappear. Everything that appeared so bright only a short time ago is now changed; darkness and

destruction is where there was light and hope only a short time ago. The iris is now projecting, covered only here and there by remains of Descemet's membrane, and we may congratulate ourselves if the process stops here and if the vitreous chamber does not become involved. Fortunately the fury of the inflammation is generally spent by this time and marked improvement is apt to be seen within the next twenty-four hours. The prognosis for vision, however, is poor, for whether the process stops here, or whether the rest of the eye becomes involved, the sight is not likely to come back; in the former case, however, the shape of the ball may under favorable conditions be saved; whereas, if panophthalmitis sets in, a small, shrunken eyeball will be the result. If the larger portion of the cornea has been destroyed great care must be exercised in everting the lids for the purpose of making applications or cleansing the eye, for the lens is apt to be lost upon the slightest pressure on the eye. Not unfrequently the clear transparent lens is found on the cheek of the patient some morning after perforation had taken place. The pain is apt to continue as long as the corneal ulcer is progressive, but it will cease as soon as the ulcer has penetrated; this is followed by a gush of the escaping aqueous humor and great relief of all pain. The escape of the lens from the eye will destroy the last chance of vision, but such an eye is not so apt to be disfigured by extensive bulging of the corneal scar; the formation of a corneal

staphyloma is more likely to occur if the lens remains in the eye.

In view of these great dangers which follow an affection of the cornea during the progress of a purulent conjunctivitis, it is the duty of the attending physician to examine this part of the eye at every visit and the slightest change in its transparency should call at once for the most vigorous preventive measures. At times there may be an œdematous condition of the cornea preceding the infiltration; this is diagnosed by a peculiar hazy or rather steamy condition of its surface; it appears likewise to be firmly stippled on account of loss of epithelial cells. At times there may be isolated foci of infiltration in different parts of the cornea, the rest of it appearing perfectly normal and remaining so, but there is frequently a tendency on the part of these foci to coalesce and form a large ulcer of the cornea.

If there is much redness of the lids, and especially if the ocular conjunctiva is very much inflamed and thickened, the cornea must be examined very carefully, and it is just in these cases that this is a matter of great difficulty. A lid retractor to lift the upper lid is of great help; the lower one is easily depressed, but in cases of marked œdema it may become necessary to use one for the lower lid likewise, in order to get a good view of the lower half of the cornea. It is, however, possible to expose the entire cornea for inspection. Standing behind the patient,

the forefinger of the left hand is placed gently but firmly to the extreme edge of the upper lid; pressing now gently up and slightly backwards, the upper half of the eyeball is exposed; using the same finger of the right hand in the same manner for the lower lid, this is more readily depressed, allowing an inspection of the lower half of the cornea. A slight loss of blood that is apt to ooze out from the conjunctiva need not be dreaded.

Even the slightest ulcerations of the cornea may, after a subsidence of the conjunctival trouble, leave the sight of the patient materially damaged on account of the opacity they produce.

Maculae of the cornea, if central and if occurring in adults or still older people, can never be entirely recovered from. Deep ulcerations extending beyond the anterior elastic membrane of the cornea will leave dense white opacities. Such a scar is known as a *leucoma*, and that of a perforating ulcer as a *leucoma adherens*, because in these cases the iris falls forwards, becomes adherent to the wound, and remains attached to the corneal cicatrix. If the entire cornea is involved in the ulcerative process, the scar that will form is now spoken of as *total leucoma*, which means in nearly all cases blindness for this eye. In those cases where the intra-ocular tension remains high during the healing of the corneal wound, the newly formed cicatricial tissue is not able to withstand the pressure; it yields, and projects more or less above the usual

level of the cornea; this is called a *staphyloma*. It is partial, if it is the result of a smaller ulcer, and if only this corresponding portion of the cornea projects; total, if the entire cornea bulges out. A total staphyloma is, as a rule, a great deformity, and if it is so large that the lids cannot be closed over it, will give rise to many inflammatory attacks of such an eye. The vision of an eye with total staphyloma is, of course, lost, and the best surgery is, in such cases, the removal of the entire eye. Complications of the iris in the course of a purulent contagious ophthalmia are apt to follow extensive ulcerations of the cornea, but they are not of such importance as the corneal affection.

The duration of an acute attack of purulent ophthalmia is usually rather more than four weeks. In cases where one eye becomes inflamed at first and the second is infected later, this latter is apt to suffer longer if the infection occurred during the early stage of the inflammation; if a week or more time elapse before the second eye becomes sore, the attack is not apt to be quite so severe; in fact, may remain of a very mild type throughout. It appears that the germs of contagion are more vigorous and numerous during the earlier stages of the disease. It is asserted, for instance, that the true gonococcus of Neisser is found in the discharge of eyes suffering from gonorrhœal ophthalmia only during the first three or four days. The greatest danger to be dreaded is that, on account

of debility of the patient, or carelessness in regard to treatment and hygienic surroundings, the disease becomes chronic. In such cases the conjunctiva becomes thickened, red, velvety, and irregular, and may require energetic treatment for months or years before it is cured. Single cases of sporadic purulent or contagious ophthalmia are not so serious, nor do they last as long as cases occurring during an epidemic; and cases occurring in private families are likewise apt to do better and recover more quickly than those occurring in overcrowded institutions. It is especially in epidemics, in such places as military barracks, orphan asylums, reformatory schools, or prisons, where, on account of want of out-door exercise, dietetic faults, such as a want of variety or an insufficiency of food, or perhaps on account of vitiated atmosphere of overcrowded or poorly ventilated rooms, the general health of the inmates being below par, that the disease is not only dangerous and obstinate, but also apt to run into the chronic form of blenorrhœa. A very singular fact is, that the inmates of such places as mentioned above have frequently a very healthy and even a robust appearance; they may look even fat and well nourished, when in reality they are considerably less liable to resist disease in any shape or form; the viability of their cells being so low that they cannot resist the inroads of the germs of disease.

The clinical history of the different forms of blenorrhœic processes differs but slightly from that

given above. In *ophthalmia gonorrhœica* the inflammatory signs manifest themselves sometimes within a few hours after the infection and surely within twenty-four hours. Frequently the eye is badly inflamed by this time. This depends not only on the amount of the infectious matter but also upon its freshness and its source. If the discharge came directly from the inflamed parts into the eye, it may set up severe disturbances within six or eight hours. Discharge that had been partly dried is less active; and old, dried up secretion has very little, if any, infectious properties. The upper lid swells rapidly and becomes dark red; the fold of transmission projects on eversion of the lids like a fleshy mass; the conjunctiva of the eyeball becomes densely infiltrated and looks like a fleshy swelling surrounding and overlapping the border of the cornea more or less completely. Blood and serum exudes from the congested vessels if the eye is disturbed, and the lids cannot be opened except by means of the hand. There is much pain in and around the eye; the gritty sensation being especially troublesome and the tension caused by the rapid swelling of the tissues is almost unbearable. There is much local heat, and with it there is marked constitutional disturbance and generally a decided apprehension on the part of the patient for the safety of the eye. The discharge consists of hot, burning tear-fluid freely mixed with pus and epithelial cells, but the purulency of the discharge becomes very marked in a short

time and may be decidedly so in less than twenty-four hours after the infection has taken place. This disease is the most dangerous of all conjunctival inflammations.

The cornea is in great danger almost from the very beginning, and if the disease is of a very virulent type, it is liable to be lost in spite of the most careful treatment. The tissues surrounding the eye are more or less disturbed; swelling of brow and cheek may become very marked. This adds to the danger of the eye because it interferes with the return circulation and the pressure of the engorged lids upon the cornea is constantly increased. It is especially at this stage that great care must be taken not to have the secretion that had been penned up in the conjunctival sac on account of the firm closure of the lids, spurt into the eye of the nurse, whose duty it is to open and clean the lids frequently. Early, when the discharge is composed of tear-fluid, this danger is not so great, but it is advisable that nurses as well as physicians should be provided with protective eye-glasses, which are to be used during their attendance upon the patient.

Blennorrhœa neonatorum. The conjunctivitis of new-born children may be divided into two classes. The mild form is usually a simple catarrh, which is apt to prove very obstinate because infants' eyes are more difficult to clean and because their recuperative power is limited. In these cases there is as a rule not

much discharge nor marked swelling of the lids; and especially the conjunctiva of the eye-ball is not much implicated. The eyelids are glued together and there is more or less of a sticky, yellowish discharge which is apt to collect at the margin of the lids. There is very little danger to the cornea, and the disease yields readily to the usual remedies.

The other severer form is of a true blennorrhœic character and is the result of an infection from the vaginal discharge of the mother or with the purulent secretion of another eye. This is usually the case when the second eye of a child affected with blennorrhœa becomes sore several days later than the first one, which probably had become infected at the time of its birth. The first signs of this trouble as well as the usual course of the disease does not differ much from that of a gonorrhœal affection, but it is much milder in its course; however, the danger to the cornea must not be under-rated, for in these young children it seems to possess very little power of resistance and according to some statistics nearly twenty-five per cent. of the cases seen at our public institutions showed corneal complications at the time of the first visit. Of course most of these eyes are saved, but quite a number of them will become blind in spite of all our efforts. The cases seen in private practice do, as a rule, much better because the parents seek medical advice in time. The first sign that attracts the attention of the mother is perhaps the inability of the

child to open the eye; there being but very little discharge at the outset of the trouble. The eyes may not be opened for a day or longer, but if this is finally done, a creamy thick discharge escapes. If the eye is now more closely examined, it is found that there is a good deal of redness and some swelling of the conjunctiva itself. The lids are easily glued together; it is painful to the child to have the lids opened and the discharge is apt to be retained in the eye for some time; this leads to more irritation of the conjunctiva and adds to the dangers of the cornea. The conjunctiva becomes infiltrated and thickened; it has a fine velvety appearance and the folds of transmission are sometimes immensely enlarged. At other times the lids are dense and hard, the conjunctiva has a waxy, yellowish appearance and the discharge is scant and acrid. Frequently the exudation on the surface of the conjunctiva is of a plastic nature and can be removed in shreds or patches. At times the lids appear to be covered with a membranous deposit, which, however, does not firmly adhere to the lids but can be removed by means of a piece of linen. The conjunctiva underneath the membranous patch looks red, is soft and bleeds easily. The prognosis is, however, good in all these cases as long as the cornea remains clear. Weakly and poorly nourished children are more liable as a rule to have corneal complications, and in some of these cases the cornea breaks down rapidly and early. Central corneal ulcers are perhaps

more frequent among children than among adults suffering from blennorrhœic diseases. Central perforating ulcers with subsequent adhesions of the iris and staining of the capsule of the lens (anterior polar cataracts) are not very rare. Excoriations on the surface of the lids are sometimes met with which must add to the discomfort of the little patients; but as a rule they do not seem to feel very much pain, even after the cornea became affected; they cry only when the eye is disturbed and grow as rapidly as other children if they get sufficient nourishment. The lids of children suffering with this form of conjunctivitis are usually very much swollen, which is due to an œdematous infiltration. The integument of the lids is as a rule not changed, but in severe cases it is a purplish color and feels dense and hot to the touch.

Acute Granular Lids or Egyptian Ophthalmia differs but little in its clinical history from an ordinary purulent ophthalmia except that there is more infiltration of the lids and conjunctiva, and on this account more danger to the cornea. There is, furthermore, less discharge, and this is of a thin sero-purulent nature and the sequellæ of the disease are more serious. It is an affection that is very contagious, and epidemics of it are of such a serious character that it has disabled entire armies and broken up, temporarily at least, many charitable institutions. Inmates of large and overcrowded buildings are especially liable to be visited by such epidemics. The lids are early impli-

cated in the affection and it begins with profuse lachrymation; numerous conjunctival epithelial cells and some pus corpuscles and tear fluid, but little mucoid matter, constitute the discharge. The onset of the disease is apt to be sudden and there is severe pain and marked photophobia in the very beginning, it resembles in this respect a gonorrhœal attack, but a number of other cases that are apt to show themselves soon after the first one speak against this, if no other condition excluded the possibility of such a disease. A hot burning sensation of the eye tortures the patient; the lids are heavy and closed on account of their swollen condition and the conjunctiva is thickly infiltrated with scattered points of infiltration, resembling small, whitish, round bodies.

The discharge remains scant during the entire course of the disease. Corneal ulcerations or dense infiltrations are liable to occur early and often; the latter are generally small and perfectly round, but if it comes to the formation of ulcers, these are apt to be deep and lead frequently to perforations of the cornea. Moderately violent attacks of this kind are apt to occur in persons affected with chronic granular lids after exposure or irritating applications such as poultices of flax seeds, for instance. Great vascularity of the cornea and the formation of ulcers are noticed in such cases almost from the very beginning, but the duration of these attacks is only a few days under proper treatment; whereas, those occurring dur-

ing an epidemic last often many weeks or even months, and are followed by more or less trachomatous cicatrization or by chronic granular lids.

Conjunctivitis crouposa or membranous conjunctivitis is not frequently met with. It is, as its name implies, characterized by the formation of a thin grayish or yellowish membrane on the conjunctiva of the lids and at times also on that of the eyeball. This membrane is composed of irregularly arranged fibres mixed with pus cells; it is rather firmly adherent to the conjunctiva, but it can be removed by wiping; it however leaves the conjunctiva red and easily bleeding and more or less devoid of epithelial cells, and will form again in about twenty-four hours. It is apt to attack young persons, especially strumous or weakly children of about three to ten years of age; it may be found in connection with croup of the throat, and it may be the starting point of a general croupous inflammation extending from the eye to the nose, throat and bronchi. It is also apt to come on after debilitating diseases, such as whooping-cough or measles. Eczematous patches near the eyes are apt to be covered with the same membrane. There is generally great swelling of the lids and much chemosis at the onset of the disease, but not much discharge and the pain in the eye is apt to be intense. On opening the lids we find them to be heavy and covered more or less completely with this membranous deposit. On eversion of the lids, which is usually a difficult task,

hæmorrhage from the congested vessels is apt to occur. This stage may last a number of days and is followed, after a gradual disappearance of the membrane and an abatement of the swelling of the lids, by the second stage, that of discharge. This is, at times, copious and purulent; but, as a rule, there is not much of it and the recovery may be very rapid. If, however, corneal complications have occurred, which is very apt to be the case, the disease is liable to be more tedious; and if a general croupous inflammation of the air passages follows, it may end with the death of the patient. At times there is considerable shrinking of the conjunctiva, and even a moderate amount of xerosis may be the result.

Conjuncti-itis diphtheritica resembles the croupous form, but it is a much more serious affection. Fortunately, it is very seldom met with in the United States, but it destroys many eyes in some parts of Europe. The swelling of the lids, which in this disease like that of the croupous form, is very marked in the beginning, is soon followed by such intense infiltration of their entire thickness that they become as hard as a board. It becomes now a matter of great difficulty to open or evert the lids in order to inspect their conjunctival surface. There is a scant but acrid discharge, which is apt to cause fissures and excoriations on the free edge of the lid or on the cheeks and these become rapidly coated with a similar membranous deposit to that found in the eye. The color of the lid

is a red or even bluish one, due to a general stasis of the vessels; there is much local heat, but also a marked general feverish condition of the patient. The infiltration on the inner surface of the lids presents itself in the form of a dense grayish or yellow, firmly adherent membrane, which gives the eye a peculiar lardaceous appearance on eversion of the lids. The conjunctiva bleeds easily, and the chemosis is very marked. An extension of the membrane to the eyeball itself begins early, and appears to be more the rule than the exception. The nutrition of the cornea is easily interfered with, and the loss of the eye or great injury to it on account of the corneal complications makes this disease one of the most formidable ones.

The stage of infiltration is liable to last quite a number of days, and is followed by a gradual disappearance of the membrane, great redness and thickening of the conjunctiva and by a purulent discharge. The disease is now principally a purulent conjunctivitis and does not differ from the ordinary form of this stage except that, here and there, some small patches of the membranous exudation may remain visible. The pain which was very marked in the beginning has now disappeared, and, unless corneal ulceration should be present, the patient's condition is more endurable; the lids become soft, the swelling subsides, he soon begins to open his eye, and the third stage, that of repair or rather cicatrization, sets in, about three or four

weeks after the beginning of the purulent stage. The whole conjunctiva has suffered more or less, and the cicatrization may be so marked that it is apt to lead to marked changes in the structure and appearance of the conjunctiva. Changes in the shape of the lids are likewise of frequent occurrence after this disease. Young persons, and especially weakly or convalescent young children, are apt to become the victims of the disease; it occurs more frequently during an epidemic of general diphtheria, but the conjunctivitis itself seldom assumes an epidemic form; most of the cases seen by us are isolated. The probable cause of this is that during the most contagious stage there is only very little discharge.

Chronic Conjunctivitis.—Inflammatory affections of the conjunctiva, running a chronic course, are usually confined to the tarsal portion of this membrane and to the folds of transmission, and are, perhaps, of more importance to the physician than acute ones, because they are more frequently met with and are more difficult to relieve. They are to be divided according to the anatomical lesions they produce in the conjunctiva, and according to their etiology, into two classes; one that comprises those forms which usually appear as the sequel of acute conjunctivitis, and the other which embraces those that are, as a rule, of idiopathic origin.

Chronic blenorrhæic troubles and chronic catarrhal conjunctivitis belong to the first class. These diseases

resemble in their main clinical features those of the original disease, minus the acute inflammatory conditions. There is always more or less hyperæmia, and, accordingly, redness of the conjunctiva, varying from the delicate rosy hue of a mild catarrhal form, to the deep and uniform redness of a blenorrhœa. The main feature of the trouble, however, is hyperplasia of the superficial layers of the conjunctiva, and especially of the epithelial layer. This change is very marked in chronic blenorrhœa, and results in the formation of small velvety excrescences and involutions extending from one end of the lid to the other. The papillary layer is likewise much thickened, which causes small elevations which look like grains of sand, scattered over the conjunctiva, and which may lead to cicatricial changes, especially during the later stages of the disease; these may give rise to serious complications, such as entropium or trichiasis.

Pannus is likewise apt to occur, if the disease is neglected, and more or less acute exacerbations of it are apt to occur on the slightest provocations; such, for instance, as taking cold, immoderate use of intoxicating beverages, or imprudent use of the eyes for reading or sewing, especially by artificial light. The discharge is usually scant, and is not so contagious as that of the acute disease; it is principally composed of tear-fluid and epithelial cells, with an admixture of a varying amount of pus cells. The duration of the trouble depends upon the regularity of the treatment,

the care the patient exercises in regard to the avoidance of irritating influences, and in a great degree upon the hygienic surroundings of the patient. The disease may last, accordingly, months, and, in many instances, even years. The true granular condition is apt to become engrafted upon lids affected with these forms of conjunctivitis, and this may help to explain those cases where acute blenorrhœic conjunctivitis develops eventually into true granular lids. If, however, the micrococcus of Neisser and that which Sattler found in granular lids are identical, this occurrence would be even more readily explained. Eyes which have suffered from any form of chronic conjunctivitis are also more sensitive to contagious matter, such as discharge from eyes afflicted with acute blenorrhœic troubles or to urethral discharges of all kinds.

GRANULAR LIDS.

(*Syn. Conjunctivitis granulosa, Trachoma, Egyptian Ophthalmia, Syndesmitis granulosa, Granular Ophthalmia, etc.*)

The second class, true granular lids, or trachoma, is characterized by the presence of a special micrococcus (Sattler and Poucet), and by the large number of lymph cells found in the conjunctiva. These cells usually accumulate at certain points; where they form more or less marked elevations which project at times considerably above the usual level of the conjunctiva, and are in other cases more or less hidden by the thickened conjunctiva. If, besides the cell accumulations, the conjunctiva is implicated by a more or less marked blenorrhœic condition of it, and if many of the lymph cells are scattered through the stroma, we speak of the trouble as one of granular lids, and in these cases the cicatricial changes which are liable to occur during the course of the disease are apt to be marked; this condition is spoken of as trachoma. On the other hand, if there is an absence of inflammatory symptoms, or if the latter remains very superficial, thus allowing the granules to be more apparent and prominent, we have an example of the follicular form. The part the lymphatics play in follicular conjunctivitis is a matter of dispute; some authorities maintain that the accumulation of lymph

cells takes place in the lymph follicles of the conjunctiva; others deny the presence of such follicles in the normal conjunctiva, and contend that these accumulations of cells are not surrounded by a distinct membrane, such as the walls of a distended follicle would form; but that the tissue surrounding them is formed by the cells pushing and crowding away the connective tissue fibres of the conjunctiva, which becomes thus the immediate surrounding of the nest of the cells.

The clinical history of granular lids varies considerably. It may begin with marked blenorrhœic symptoms, and a discharge containing many pus cells may be present early in the beginning, but as a rule, there is not a very copious discharge in granular lids, nor is it of a thick, creamy consistency, as is apt to be the case in purulent ophthalmia. The discharge is almost grayish-yellow and thin, as a rule, and not very irritating. In the majority of cases there is so little discharge that it is scarcely noticed, and that the lids are not glued together by it when the patient awakes in the morning. There is, however, a slight discharge in most cases—enough to produce by its evaporation thin crusts on the edge of the lids or in the corners of the eye. These crusts or scales cause an itchy sensation, and this may be the only subjective symptom that the patient complains of, and even this may be so slight that it may not attract the patient's attention for some time. If the inflammation is a

little more acute, a gritty sensation and slight pain, if the eyes are used for small objects, may be complained of, and this is especially apt to occur when the eyes are exposed to the effects of artificial light. Dimness of vision is another subjective symptom. This may be due to some mucus getting over the cornea, and will, of course, not be permanent in such a case, but the impairment of vision may be both marked and permanent, and is then usually due to some impairment of the transparency of the cornea. The most frequent cause of this is panus with its accompanying blood-vessels and ulcerations of the cornea. Heaviness of the upper lid is another subjective sign of granular lids, and, if marked, the drooping of the lid may likewise impair vision to a moderate degree. After the disease has continued for some time the upper lid is apt to become so heavy that it cannot be lifted as usual, and resembles the drooping of the lid as it is met with in ptosis due to paralysis of the levator of the lid; this condition is, therefore, named false ptosis. It is apt to give the patient a sleepy appearance, and is so characteristic that it is one of the first signs to attract the physician's attention in regard to the nature of the disease, even in cases where the patient is hardly aware of any ocular trouble.

The objective signs of the disease in the very beginning are not very characteristic; in many instances they resemble those of a mild attack of catarrhal conjunctivitis and in many patients the eyes are not seen

until the disease has nearly run its course, for the onset of granular lids is apt to be so insidious that its existence is not suspected until the third stage, that of cicatrization, has fairly set in. The first stage, that of invasion, presents to us the conjunctiva in a moderate stage of congestion like that of a subacute attack of catarrh, or as we are apt to see it after the subsidence of an acute conjunctivitis; and also the bulbar conjunctiva shows some increased vascularity. The eye itself appears watery and irritable and there may be even more or less mucus in the conjunctival sac. After some time the stage of granulation sets in and small whitish bodies make their appearance. These small granules are deeply embedded in the swollen conjunctiva; they become larger and more numerous. They are scattered all over the tarsal conjunctiva but are especially numerous at the folds of transmission, and principally the upper one. The redness and vascularity of the conjunctiva become less striking because the granules have become so numerous that little of the normal conjunctiva remains. They are especially exuberant at the tarsal folds and often coalesce at this location and it appears upon thorough eversion of the lids like a lardaceous thickening with numerous and irregular projections. These latter belong already to the third stage, that of cicatrization; the fibrous surrounding of the infiltrated spots contracts, producing rough, irregular elevations which are filled with lymph cells. A little pressure suffices

often to rupture the enveloping tissue and the cells contained in these granulations are readily squeezed out. As the stage of absorption and cicatrization advances whitish tissue bands can be seen traversing the conjunctiva, usually in a horizontal direction; these increase in size and number until the greater portion of the conjunctiva is changed or destroyed. In milder cases, with a more diffuse infiltration of lymph cells, the conjunctiva becomes very thin and atrophic and has a blueish appearance. In still milder cases complete absorption of the inflammatory products follows and the conjunctiva is restored to its former healthy condition; this may also occur if the disease is early recognized and promptly and perseveringly treated.

The follicular form of granular lids is rarely seen during its earlier stages and may exist for years without causing serious inconvenience to the patient; in fact absorption of the granules and restoration to the normal condition may take place without treatment. The reason for this is that the cell accumulations are isolated and that the rest of the conjunctiva is scarcely affected. Another reason is that the follicles are located principally in the lower lid, where they do not press upon the cornea; this explains likewise the fact that this form of conjunctivitis is not only almost without discharge, but is also apt to be free from corneal complications, such as pannus and ulcers. The number and size of these granules vary considerably; from a few scattered follicles on the conjunctival

5 1

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surface of the lower lid the number varies to hundreds of them. In such a case they are apt to be arranged in longitudinal rows like strings of pearls and may not only cover the tarsal conjunctiva, but form likewise on the bulbar conjunctiva. We may have large masses of them overhanging the upper portion of the eyeball, resembling in their shape miniature bunches of grapes. These accumulations are connected with the folds of transmission and may be exposed to view by lifting the upper lid, the patient looking downward at the same time. The normal color of these follicles is yellowish-white, and they have the appearance of frogspawn or boiled grains of sago. But if the overlying conjunctiva is hyperæmic, they look more or less red. The follicles vary in size from that of a rape seed to that of the hemp seed; they are usually small when they are found on the bulbar conjunctiva; they appear also clearer and almost transparent when found in this location, resembling small vesicles. Vesicular formations resembling this disease are frequently seen in children or young persons after mild attacks of catarrhal conjunctivitis, but such follicles, or rather vesicles, are caused by the lifting up of the epithelial layer by exudation fluid; they are scattered over the conjunctiva and disappear with the last traces of the original disease. The differential diagnosis between the follicular and the true form of granular lids is not always easy, especially if the blennorrhœic symptoms of the conjunctiva are marked, and it is principally

the absence or presence of cicatricial changes which will decide the nature of the trouble, and, the follicle as well as the trachoma granule being inflammatory products and containing both the well-known lymphoid cells, the difference depends principally upon the mode of infiltration, and the condition of the rest of the conjunctiva.

Amyloid Tumors of the Conjunctiva.—Granulations of a peculiar structure, resembling granular lids and not unfrequently a sequel of them, are sometimes met with; they are not contagious, spring from the epithelial folds of the cul-de-sacs, projecting beyond the conjunctival surface, rest upon a cicatricial base, which may resemble a regular pedicle, have a soft, flabby appearance and are of yellowish color. Treated with iodine, they give the peculiar reaction of amyloid degeneration; they are rarely seen in this country.

Complications and Sequellæ of granulated lids are principally due to the cicatricial changes which take place in the conjunctiva during the later stage of the disease. Not only do the cicatrices interfere with or destroy the normal function of the conjunctiva, especially its secretory power, causing thereby more or less dryness of the eye, which has received the name of *Xerosis*, but by their roughness (this has given rise to the name of trachoma) they cause enough friction upon the cornea to set up serious changes of its epithelial layer, which has received the name of *Pannus*. Any mechanical irritation of the cornea, such, for in-

stance, as is caused by an inverted eyelash, may give rise to pannus, but it is especially in granular lids that we are apt to meet with this serious complication. It is not necessary, however, that the conjunctiva be scarred in order to cause pannus; the softer roughness of the granulations give rise to it, in the still softer follicles of follicular conjunctivitis; it is, however, not often met with. There is usually added to the roughness of the lids, its increased weight and this is the reason why in nearly all cases of pannus it originates in and usually remains confined to the upper portion of the cornea, which has to bear the weight of the upper lid. In obstinate cases the pannus may extend over the entire surface of the cornea and invade even the deeper parts of the organ, predisposing it to ulcerative attacks and leading, in younger and more debilitated persons with impaired power of resistance, to a general softening of the cornea, which, yielding to the intraocular tension, may lead to a general bulging of it (Staphyloma corneæ or Buphthalmos), and more or less complete blindness of the eye. Ulceration of the cornea may occur sooner or later in the course of the disease; it may never make its appearance in markedly violent cases, and in others it may be the first symptom that excites the anxiety of a patient with granular lids, who did not suspect that his eyes were diseased before the sight became affected on account of this complication. In some cases the pannus may spread very rapidly over

the entire cornea, and in others it may remain stationary for some time, even for years. The depth of the process as well as its vascularity varies also considerably in different cases. A few scattered vessels without any apparent elevation of the epithelial layer is seen in one case, whereas, the swelling and vascularity in other cases may be so marked as to give the pannus the appearance of a red, fleshy mass, covering the upper portion of the cornea (*Pannus crassus*). In other instances we see no blood-vessels or elevation, only a diffuse dimness of the upper part of the cornea is visible (*Pannus siccus*). Pannus, in itself, is not a very painful affection; and if the patient complains about severe and sudden pain in the course of the disease, we should look for beginning ulceration of the cornea. Marginal ulcerations of the cornea, which we are so apt to meet in acute conjunctival affections, are, however, rare in granular lids. Impairment of sight depends more upon the extent of the pannus than upon its thickness, and so long as the pupillary space is not invaded it is not much affected.

The pathological changes of the cornea are first observed in the superficial epithelial layers. Loss of cells causes an unevenness, which gives the cornea a stippled appearance, this is followed by the appearance of fine blood-vessels, which gradually increase in size, length and number. These vessels are usually superficial and are derived from the vessels of the congested and inflamed limbus. This part of the conjunctiva,

covering the margin of the cornea is, as a rule, not much involved in granular lids, but the disease may extend especially to the upper portion of it, and I have not unfrequently seen distinct granular deposits of lymph cells or diffuse lymphoid infiltration of it. In such a case we may get a direct extension of the inflammation from it to the cornea. Together with the appearance of the bloodvessels, an infiltration of lymphoid cells and formation of new tissue takes place, which may partly involve the corneal tissue proper. The infiltration, originating in the limbus, takes place usually between the anterior elastic lamina and the epithelial layers. After the disappearance of the pannus the cornea is apt to remain hazy and in severe cases cicatricial tissue, which is more or less opaque, may leave the patient almost blind.

Cicatrization and contraction of the entire conjunctiva may lead to obliteration of the tarsal folds, and at times, by traction on the free margin of the lids, to a more or less complete turning in of it. If the inversion is only partial, it leads to a turning of the eyelashes, which become now directed toward the eyeball, and which, especially on closing the lids, must come in contact with the cornea (trichiasis). This adds to the irritation, and to the formation of pannus. If the inversion is complete, the entire free margin of the lid is inverted (*entropium*). Both of these deformities are apt to be permanent unless they are relieved by operative interference. Of the number

of different operations recommended for this purpose, those proposed by Dr. Hotz, of Chicago, Dr. Green, of St. Louis, and Dr. Arlt, of Vienna, are especially useful and effective.

Another and more frequent form of trichiasis is caused by cicatrization of the muscular layers in the region of the roots of the eyelashes. By the action of these cicatrices, which are the result of an inflammation of this part of the lid, due to an extension from the process in the conjunctiva to the free edge of the lid, the direction of one or a number of hair follicles is changed and directed downward or inward instead of outward, and the new lashes (the old ones having been lost during the preceding inflammation) grow in the direction of their follicles, apparently through the delicate skin of the free edge of the lid toward the eyeball. These so-called wild eyelashes are generally stunted in their growth, very fine, and without any color, so that their detection is sometimes a matter of great difficulty. At times they are, however, thicker and stiff like thorns, and these are generally of a dark color. Both kinds are apt to cause great suffering, pain and photophobia to the patient, and injurious opacities of the cornea, which, if not relieved, may make the patient practically blind. The pulling out of these lashes, *epilation*, is usually followed by a new crop, and the only true way of dealing with them is the destruction of the hair-bulbs by means of electrolysis, or, if they are numerous, by an operation result-

ing in a transplantation or change of direction of the bulbs. The entropium operations recommended above will answer for this purpose.

Among the sequellæ of granular lids, changes in the curvature of the so-called cartilage and a drooping of the heavy, thickened lid (*false ptosis*), are observed, and even an extension of the inflammation to the tear-sac may occur at times.

Prognosis.—The duration of granular lids depends upon the attention that is given to it; but even under the most favorable conditions it will last for months, and the more indolent forms may last for many years in spite of our efforts to relieve it.

The mode of transmission of the contagious principle of granular lids does not differ from those mentioned above. Transmission of it through the atmosphere does not appear probable, and has not yet been demonstrated. Small children seem to be less liable to infection of granular lids, and in certain countries its occurrence is less frequent than in others. Oriental nations suffer more from it, for instance, than the inhabitants of Switzerland. The negro race is almost free from it, whereas, it is of frequent occurrence in Ireland. It is frequently carried from one country to another by armies or emigrants, and English authors blame the Jews and Irish for spreading it all over the world. The slight watery discharge of the follicular variety is less contagious than the mucopurulent one of true granular lids.

CAUSES OF CONJUNCTIVITIS.

The principal cause of the larger number of inflammatory affections of the conjunctiva is infection with the discharge of inflamed eyes. But leaving aside the question of infection at present, we find that the causes of milder forms of conjunctivitis are atmospheric changes, improper use of the organ, and the action of irritating agents, which may act locally or by affecting the general system.

Atmospheric influences may be great dryness or moisture, or too sudden changes of temperature: chilling. This is especially apt to occur in the spring and autumn, and these are the seasons in which we usually meet with the largest number of cases of *acute or subacute catarrhal diseases of the conjunctiva*. There are several forms of this kind of conjunctivitis; one of them, more subacute in nature, but very obstinate in its course, has been called *vernal*, or *autumnal catarrh of the conjunctiva*. This is characterized by an early participation of the bulbar conjunctiva, and by marked hypertrophy of the limbus.

Another form that must be mentioned here is that in which both the conjunctiva of the lids and eyeball are markedly and simultaneously injected. Eyes afflicted in this manner have a peculiar bright-red appearance, and the disease is commonly known by the name of *pinkeye*.

Still another form due to similar causes which is especially apt to show itself in debilitated children, and sometimes in adults, is that which is characterized by profuse serous infiltration of the conjunctiva and the eyelids. The variety is almost free of discharge and is spoken of as "*œdematous conjunctivitis*." Another variety due to the same cause is the "*Schwellungs-catarrh*." The folds of transmission, especially the upper ones, are greatly swollen and appear like fleshy glistening masses on eversion of the lids; it is one of the severer forms of conjunctival inflammations.

Conjunctivitis is sometimes caused by abuse of the eyes; such as reading by too bright or especially by insufficient light. Errors of refraction, especially astigmatism and hypermetropia, if uncorrected, will frequently set up a mild but very obstinate form of conjunctivitis, which is very often associated with a mild inflammation of the free edge of the lid and which can only be relieved effectually by the use of proper glasses.

Among the irritating influences we have to mention impure air. The impurity of the air may be due to obnoxious gases, which we find to be the case in overcrowded and badly ventilated rooms. The injurious admixtures of the air become absorbed by the moisture of the eye and act as chemical irritants; they are likewise the cause of a lowering of the general health and act as a predisposing cause. The admix-

ture of the air may also be of a mechanical nature. In walking through the crowded and not over-cleanly streets of our large cities one is surrounded by an atmosphere which is loaded with the sweepings of the street, consisting of dust, horse manure, etc., which if they get into the eyes are very apt to set up irritation and inflammation. Only a few years ago New York city was visited by a mild form of conjunctivitis which was caused by the dirty condition of her streets. Irritants of the air of a mechanical nature are, however, not confined to large cities; they are also found in certain localities where the air is loaded with the dust of limestone or fine sand; it is for this reason that we find in the plateaus of Nebraska, Arizona, Arkansas and a few other states such a great number of conjunctival diseases of a severe and tedious form; in many instances it is impossible to relieve the trouble as long as the patient remains in those localities. Another mechanical irritant is snow. In very severe winters and on large plains the snow is driven into the eyes of the travelers and together with the irritating effect of the light reflected from the snow, it gives rise to a condition known as snow-blindness, although sometimes this disease may not be accompanied by conjunctivitis, but the conjunctival disease may aggravate the usual form of snow-blindness to such an extent that it results in total blindness on account of the corneal complications which follow the conjunctivitis. The Esquimaux protect themselves by means

of wooden spectacles which have small central openings and serve to keep off light as well as snow.

Conjunctivitis is also caused by the action of irritating drugs. Capsicum or cantharides, for instance, if thrown into the conjunctival sac, will set up an acute and very painful inflammation. Jequirity bean, especially an infusion of it, will, if applied to the eyes, give rise to a very severe conjunctivitis, which may become even dangerous to the cornea. Strong acids as well as strong alkalies act in a similar manner, and in some instances drugs that have no special irritating properties and are frequently applied to the eyes without causing any disturbance may at times give rise to a severe inflammation of the conjunctiva and even of the integument of the lids and the face; atropine, duboisine and other mydriatics will sometimes act in this manner, and even iodoform may act as such an irritant in certain individuals.

An important predisposing cause of the development of conjunctivitis as well as of its rapid extension is a lowered condition of the general system. Conjunctivitis, if, for instance, affecting old, debilitated persons, is at times almost impossible to eradicate; it is also apt to be met with in persons that have been fasting during the lental season or that have been living almost entirely upon one kind of food, not having sufficient variety of diet. Sailors or soldiers having been on long voyages or marches are therefore more liable to contract conjunctivitis, and the disease

is liable to assume a more serious form, necessitating at times the disbandment of entire armies, or interfering very materially with the efficiency of the soldiers. this is probably why in the asylums, where the diet is nearly the same throughout the entire year, there is apt to be so much conjunctivitis and granular lids. The children lose the power of resistance which is required to overcome injurious influences and are therefore more apt to become the prey of granular lids and similar conjunctival affections. Overcrowding of institutions is another one of these causes, because it leads to a vitiated condition of the atmosphere. The longer and greater this crowding together the greater the danger. This has been forcibly demonstrated during the late examination of the asylums and industrial schools in the city of New York. Children that had been in such institutions for a short period only were less frequently affected with granular lids than those that had been inmates for a number of years; the percentage of the latter rose often to 50 or 60 per cent., whereas the former suffered to an extent of 10 to 15 per cent. Inmates of industrial schools, working in low, over-crowded rooms with a small number of cubic feet of air to each child, suffered more from granular lids than other children working in large, well ventilated rooms, even if their work was more trying to the eye than that of the former.

Air flooded with the spores of the common mould fungus (*Penecillium glaucum*) is very injurious. This

condition of an atmosphere favorable to development of the mould fungus as well as the presence of its spores in it, are both irritating to the eye.

Race and nationality have some influence in conjunctival diseases. Some nations, or rather countries, are almost exempt from granular lids, with others it is of more frequent occurrence. The negro races have suffered but very little from the latter trouble; on the other hand, it is very common among the people of the Orient and among the Irish; it prevails in Egypt and Turkey to such an extent that among the lower classes a perfectly normal conjunctiva is scarce.

The most important etiological factor of conjunctivitis is, however, contagion, and it is a singular fact that this disease if due to contagion is apt to be severer than the iodopathic form. The source of the contagious matter is in most cases the discharge of a diseased conjunctiva, but it may be the discharge of an inflamed urethra or vagina, or, to a less degree, that of an inflamed tear-sac. Diphtheritic matter from an inflamed throat may cause at times a similar disease in the eye, but it is not so dangerous to the conjunctiva as it is to the mucous membrane of the throat, and purulent discharges of an abscess or inflamed ear is not a source of great danger; there are very few cases on record where conjunctivitis was caused by such discharges. The severity of a conjunctivitis is partly due to the source of the contagious matter and partly to the power of resistance of the conjunctiva itself,

which in turn depends upon its own healthy condition or upon the general health of the patient. Old, debilitated persons, for instance, are not only apt to suffer severely, but the conjunctival affections in such eyes are apt to be very rebellious to treatment, and run an unusually long course. The virulence of the contagious matter depends on the source of its origin; an acutely inflamed conjunctiva, with abundant purulent discharge, is apt to set up a severer type of inflammation than that which a chronic inflammation will produce. The active principle of the contagious matter was formerly supposed to be the pus-cell it contains, but later investigations seem to prove that a specific micrococcus is the real causative agent. The more active the micrococci and the less resistance the tissues offer to their invasion, the more pronounced will be the disease.

Direct contact with the conjunctiva is always necessary to start an inflammation. The theory that the air may become the carrier of the contagious matter is hardly tenable, for if the contagious principle of the discharge is not destroyed by its becoming dry enough to be carried by the air, it would become so diluted that it would be rendered harmless. The most common carriers of the contagious matter are the fingers of the patient, which are not only liable to inoculate the fellow eye, but are apt to convey the poison to articles that are either brought into direct contact with other eyes or that are handled or touched by

other persons and carried in turn by their hands to their eyes.

Handkerchiefs, lent by sympathizing friends, and towels, especially the roller towel, which used to be so much in vogue in asylums and similar institutions, are frequently the means of contagion. The common house fly is sometimes the connecting link, especially in younger children; it will be attracted by the sweetish odor of the discharge, and lighting upon the eye of another child, especially if this is asleep, may carry the poison on its feet to healthy eyes. Spectacle frames may likewise serve to convey the contagion from one person to another. I have seen several cases where granular lids had been contracted in this way.

The danger that the contagious matter may be spurted into the eye of the nurse or physician in opening inflamed eyes is great enough to make the use of large protective spectacles for persons attending many patients of this class, a matter of prudence and even necessity.

On account of the possibility of carrying contagious matter from one person to another by the brush used for topical applications, especially when a number of cases, mild and severe ones, are treated at one time, it is advisable to use pledges of cotton twisted around a probe or a toothpick instead; this should be thrown away after one application has been made with it; or each patient should be provided with a separate brush.

In regard to blennorrhœa neonatorum there is but little doubt that it is due to a specific micrococcus, which is found in the vaginal secretion of the mother, and which, if it gets into the eye of the child during its passage through the vagina or is carried to the eye after birth by means of sponges or towels that had been employed about the mother, will set up an intense inflammation of the conjunctiva. The disease is more frequent in children of primaparæ or after a tedious and protracted labor, especially if the instruments had to be employed to extract the child, because in these cases the chances of the vaginal secretion to get into the eye are, of course, greater than during a normal delivery.

Epidemics as well as isolated cases of severe conjunctivitis in infants have been traced to vaginitis of other infants or young girls, but these will probably have to be classified among the gonorrhœal affections, even if the vaginitis that gave rise to them was of a non-specific kind.

Infection from other children afflicted with the disease will occur at times, but considering the fact that leucorrhœal as well as gonorrhœal discharges of the vagina may cause the disease and that a very large number of pregnant women suffer more or less from vaginal discharges, it is surprising that not more children are affected, for, as frequent as it has been in some lying-in asylums, its occurrence is rather unfrequent, I might almost say rare in private practice.

This depends not entirely upon greater cleanliness, but partially upon the different character of the women confined in asylums and upon the general surroundings, however, also here the preventive treatment of Credé has diminished the number of cases considerably. This method consists of dropping one or two drops of a solution of 10 grains of nitrate of silver to one ounce of water into the eyes of the infant after its birth. Carbolic acid solutions have been employed for the same purpose, but they are not so reliable as the former.

The gonorrhœal discharge of the urethra furnishes perhaps the most virulent poison for the conjunctiva. It gives rise to the so-called *gonorrhœal ophthalmia*, a disease which is often so violent and dangerous that most of the eyes attacked by it become blind or seriously damaged. The discharge of an acute gonorrhœa is, of course, most dangerous, but even that of a slight attack, or that of a mild case of gleet, the existence of which has been almost forgotten by the patient, may, if it gets into the eye, lead to the destruction of this organ.

The severity of a gonorrhœal ophthalmia depends, as a rule, upon the amount of the gonorrhœal discharge that has entered the eye, and whether the contagion is direct from the urethra with fresh matter, or whether dried crusts from towels or bandages carried the contagion. The older and drier the hardened discharge is, the less virulent it is, and the time in

which the conjunctivitis shows itself differs likewise from a few hours to two or three days, according to the condition of the contagious matter. The gonococcus of Neisser being the most important feature, the vitality of it as well as the susceptibility of the infected conjunctiva must influence the conjunctivitis following the infection. The manner in which the infectious matter reaches the eye varies considerably, but as the right hand is usually employed in cleaning the diseased parts, it is not unfrequently the carrier of the poison, and it is for this reason that the right eye is more frequently affected with gonorrhœal ophthalmia. Bathing slightly inflamed eyes with urine, which was formerly quite a popular remedy, has undoubtedly led, at times to gonorrhœal affections of the eye. Gonorrhœal ophthalmia has been produced purposely by inoculating eyes that were nearly blind from obstinate pannus and granular lids, hoping that the subsequent inflammation would lead to the cure of the pannus. Transmission of the disease of one eye to the other is likewise of frequent occurrence, and on account of the great danger of this disease to the sight, it is the first duty of the attending physician to prevent the infection of the second, good eye, by the discharge of the infected one. This is next to impossible unless a protective bandage is applied at once over the healthy eye.

On account of the great virulence of the discharge and the severity of this form of conjunctivitis, the

greatest care should be exercised to prevent the disease, after it has shown itself, from spreading to other persons, which, as members of the family, or as inmates of the same institution, are liable to come in contact with the patient. The danger is especially great if the disease shows itself among the soldiers during a campaign, when they are crowded into small tents and have not the facilities for keeping themselves as clean as they would in ordinary life. The disease has also been known to attack children that were in the charge of nurses suffering with gonorrhœa. A serious epidemic of this kind occurred recently in an asylum of New York City.

The gonococcus seems to be more perfectly developed during the first three days after the discharge of the eye has shown itself, and it is at this time that the discharge is especially virulent and the danger of contagion is greater than at any subsequent period, but the discharge retains some of its infectious power as long as it remains purulent.

Granular lids are almost entirely due to contagion, but the exact nature of the contagious principle which causes the lymphoid infiltration, characterizing the disease, is not yet fully understood. It is probable that a certain micro-organism is the principal factor. Sattler thought he had discovered it several years ago, and Poncet describes the microbe as very small, round, filling the centre of the cells of the conjunctiva as well as those of the epithelium of

the cornea. Very little, however, is known about its peculiarities, and even its existence is doubted by many competent observers. Granular lids may appear sporadic, and their development during chronic inflammations of the conjunctiva has been observed frequently, even if there was no possibility of contagion. However, these are rather exceptions, and in the great number of cases the disease is due to direct contagion and is apt to show itself in the form of endemics and epidemics. Like other contagious diseases, its spread is greatly favored by overcrowding in institutions, which favors the transmission of the infectious discharge from one person to another. An important factor is, however, the health and power of resistance of the conjunctiva; the disease is much more apt to develop in eyes, the conjunctiva of which has been weakened by catarrhal or other inflammations.

TREATMENT OF CONJUNCTIVITIS.

Many of the acute conjunctival diseases require more careful nursing than medication, but the chronic affections are very different in this respect. An acute catarrhal conjunctivitis, for instance, will often get well if left alone, especially if the general health and the vitality of the patient is good and if irritating influences are guarded against. On the other hand a chronic conjunctivitis will require not only the most careful local treatment but also the general system will have to be looked after and even an entire change of surroundings may become necessary until the disease is mastered.

Treatment of catarrhal conjunctivitis.—Thousands of cases of a milder type of this trouble get well without any medical aid, but in all of them there is a possibility that the disease may lead to the infection of other eyes or become chronic, and for these reasons alone even the milder cases should not be neglected. Some forms of the disease accompany diseases that are quite serious, such, for instance, as measles or small pox, and do not, as a rule, call for special treatment, except if the secretion accompanying them is profuse; but even in these instances the mildest remedies are the best. Acid boricum 3 j to be dissolved in half a pint of water, should be used to wash out the conjunctival sac every hour, or in

milder cases every four hours. This is to be done as long as there is any discharge, or as long as the patients complain about a burning or itching sensation of the eye-lids. It must not be forgotten that a weakness of the conjunctiva, especially after measles, may annoy the patient for years, and it is better for this reason to protect the eyes of such patients by keeping the room moderately dark, and to forbid them to read or to strain their eyes in any manner as long as the disease and the period of convalescence lasts. Redness of the margin of the lids is apt to accompany an obstinate conjunctivitis of this kind. One of the best remedies for this condition is:

B Sodæ biboratis, grs. xx.
Aquæ camphoræ, ℥ iss.
Mucilago cydoniorum,
Aquæ Laurocerasi, āā ℥ ss.

M. S. Apply to the lids and drop into the eye three times a day.

Mild cases of catarrhal conjunctivitis with very little discharge and no infiltration or swelling of the conjunctiva yield often to a wash of sodæ biboratis 3 j to one pint of tepid water. The wash may be instilled into the eye by means of a dropper.

If the catarrhal inflammation is more acute it becomes more contagious and more care should be exercised to isolate the patient, and more powerful remedies are called for. If there is much local heat cold

applications are necessary. They are to be applied by means of pledgets of linen or absorbent cotton dipped in ice-water and placed over the closed lids. They are to be renewed before they get warm; this should be continued from ten to thirty minutes, from three to twelve times a day, according to the severity of the case.

Astringent solutions are of great help in conjunction with the cold applications. Alum 3j is to be dissolved in a pint of water, and to be used three or five times a day. Sulphate or acetate of zinc, one grain to one ounce of camphor water, are often used. The addition of one or two grains of the muriate of cocaine will prove very grateful to the patient. In case the discharge should become more purulent it is well to use a mild solution of nitrate of silver (five grains to one ounce of water) once a day, applied to the everted lids by means of a small brush or a small quantity of cotton twisted around a probe or wooden tooth-pick. In order to avoid the pain which is apt to follow the application of nitrate of silver, a few drops of cocaine may be instilled into the eye a minute or two before the application is made and cold compresses should follow the application if it can be conveniently done. Leeches may be applied to the temporal region near the outer canthus in cases of intense swelling and redness of the lids; but it is not often that this becomes necessary. If the swelling or œdema of the

lids is very marked hot water applications are usually more greatful to the patient than cold ones. This is especially apt to be the case in young children, but also many adults will prefer it. The water should be made very hot and frequently renewed. It must not be forgotten, however, that if the pledgets are not frequently renewed (every two or three minutes) they will act as a poultice and may do great harm.

The treatment of a catarrhal conjunctivitis should be continued until all traces of a discharge have disappeared, for even if the inflammation itself is not dangerous, the danger of contagion continues as long as there is any discharge. If the disease has become chronic the treatment should be very prompt and persevering.

The remedies mentioned above may be somewhat increased in strength, or more powerful ones may be selected. Tannin in powder dusted into the eyes, or a solution of it (gr. xv.) in glycerine (℥ ss) is to be brushed over the everted lids. Alum in the shape of crystal rubbed over the conjunctiva once or twice a day, or the following lotion:

℞ Alumenis, gr. xv.
Cocain mur., gr. iii.
Aquæ camphor, ℥ j.

S. Two drops to be dropped into the eye morning and evening.

An old favorite preparation of mine is the collyrium astringens luteum:

℞ Camphoræ, gr. ix.
Alcohol, 3 j.
Ammonii chloridi, gr. xv.
Zinci sulphatis, gr. xxx.
Croci Hispanici, gr. ii.
Aquæ destillatæ, ℥ x.
M. f. collyrium et filtra.

S. One or two drops to be dropped into the eye morning and evening.

It is especially useful in very chronic indolent cases, where there is much thickening of the conjunctiva. Another excellent remedy in these conditions, and especially in the treatment of the chronic catarrh of asylums is:

℞ Balsam copaiba, 3 i.
Ungt. petrolei, ℥ i.

M. S. To be applied to the eye by means of a probe, once a day.

The boro-glycerite is likewise of great service in similar cases:

℞ Solutio. boro-glycer., 50 per cent., 3 j.
Ungt. petrolei, 3 iiij.

M. S. Apply by means of brush to the everted lids twice a day.

℞ Hydrastini muriatici, gr. x.
Aq. camphoræ, ℥ ss.

M. S. Drop into the conjunctival sac morning and evening.

This preparation is somewhat painful to the pa-

tient, but it is an excellent remedy in cases where the conjunctival sac continues to discharge muco-purulent matter from wearing an artificial eye.

Exposure to bright light ought to be avoided (smoked glasses); and fine work, especially by artificial light, should not be allowed as long as the disease lasts.

In the earlier stages of the disease there is sometimes great pain and photophobia, which is promptly relieved by dropping a few drops of a weak solution of atropine into the eye. This should be done only for one or two days, and frequently a single application suffices to relieve the pain.

TREATMENT OF ACUTE PURULENT DISEASES OF THE CONJUNCTIVA.

The main indications for the treatment of these affections are in the first place to diminish or destroy the activity of the poison which gave rise to the disease, and which in all probability is some kind of a coccus; to remove the secretion, which in itself acts as an irritant to the conjunctiva, and to prevent serious complications of other parts of the eye, especially of the cornea.

If the patient is seen early enough after the infection takes place, there is a possibility of destroying the virus before the conjunctiva becomes affected. Numerous instances are known where gonorrhœal or diphtheritic matter entered the eye, and where the prompt use of a two- or three-per-cent. solution of nitrate of silver has saved the eye and prevented an attack of conjunctivitis. The best illustration of the success of this treatment is shown by Créde's method, which has diminished the occurrence of blennorrhœa of the newborn in lying-in asylums.

When no nitrate of silver is at hand, a three- or five-per-cent. solution of carbolic acid may be carefully applied, by brushing it over the conjunctiva. It is well not to drop it on the cornea, as it might burn it and give rise to marked corneal opacities. If these or no other remedies can be had, we should try to

dilute the poison by copious use of fresh water. Thirty thousand parts of water will render one part of infectious matter perfectly harmless.

Unfortunately, the cases of infection with purulent secretion from inflamed eyes or urethra occur frequently unbeknown to the patient, or the latter is too tardy to seek medical advice, so that the outbreak of the disease is prevented only in comparatively few instances; the physician usually seeing the eye only after the disease has made considerable headway. In order to diminish the activity of the infectious matter after it has set up an inflammation, the best remedies are those that diminish or destroy the viability of the cocci and control the inflammation at the same time. The simplest of these are cold, heat and cleanliness. Cold applications should be made by means of small quantities of absorbent cotton or in very young children by means of small pieces of linen, which have been on ice long enough to make them thoroughly cold; they are to be applied and changed very frequently. To apply the ice directly to the eyelids is not advisable, as it might lower the viability of the lids or the cornea too much. For this reason the use of hot water instead of the cold compresses has been recommended and it has proved so successful in many instances that some physicians prefer to use it in all cases. It has the great advantage that it may be applied directly to the inflamed conjunctiva, and that it will likewise cleanse the eye very effectually.

The water used for this purpose should be as hot as 125° to 140° F.; it should be applied to the lids as well as to the conjunctiva. The simplest way to do this is by means of pledgets of cotton, placing them on the closed lids and renewing them as soon as they get cold, which may be in a half or one or two minutes. Every now and then the lids are to be opened and the water, of a temperature mentioned before, should be made to run through the conjunctival sac and wash out the discharge as soon as it has formed. In cases which are severe from the very beginning, this may be continued for several hours in succession, but as a rule it will be sufficient to make the applications for half an hour and to discontinue them for the next half hour. Very mild antiseptic remedies, such as small quantities of boracic acid may be added to the water, but the hot water itself is so efficient an agent and the necessity to avoid all irritating remedies is so important that but little is gained by the admixture of such remedies. The addition of a small quantity of common salt, half a teaspoonful to a quart of hot water renders the use of the hot applications to the conjunctival sac much more grateful to the patient than that of hot water alone, probably because it is so much like the tear-fluid.

It being very important that the eye is thoroughly cleansed, a solution of boric acid in cold water, or the hot water, should be thrown gently into the eye by means of a small syringe or atropine dropper, or the

fluid may be allowed to drop into the eye from a small pledget of absorbent cotton, which is saturated with it. It will be useful to lift up the upper lid gently, thus allowing the fluid to get between it and the eyeball, for it is here where the thick secretion is apt to be retained. By directing the patient to look up, and making slight traction on the lower lid, the lower cul-de-sac is readily exposed and cleaned.

The next indication for the successful treatment of acute conjunctival inflammations is to prevent complications of other parts of the eye. The greatest danger is that of ulcerations of the cornea. As the impairment of nutrition of the cornea is perhaps the principal cause of such accidents, and as this is usually due to the pressure of exudative products near the periphery of the cornea, and likewise to the pressure of the heavy inflamed upper lid upon this part of the eye, we should try to diminish these dangers by local applications to the lids, of which hot water is perhaps the best, and ice-compressions the next. Scarification of the conjunctiva and leeches to the outer canthus of the eye used to be more in vogue than they are at present, and in little children it should certainly be done only in exceptional cases. In case an ulcer should have formed, the presence of the purulent discharge will act as a constant irritant, and the greatest care should be exercised to keep the eye as clean as possible, or to destroy the infectious principle of the discharge by the use of antiseptic remedies, such as

the bichloride of mercury, one part dissolved in 3,000 or 5,000 parts of water, or the biniodide of mercury dissolved in 20,000 parts of water. Carbolic acid is apt to be very irritating, and so are strong solutions of salicylic acid.

However, cleanliness is perhaps of as much service as any of these remedies, and a very mild solution of boric acid or a much diluted solution of salt used frequently to cleanse the eye are as good as anything and they will certainly do no harm.

As long as the patient is able to open the lids there is perhaps not so much danger, for the act of opening the eye relieves the pressure on the cornea for a time at least, and the discharge cannot possibly collect to a dangerous extent.

In the beginning of very severe attacks of conjunctivitis this treatment will be all that can be done, for in many of these cases the upper lid is so swollen and infiltrated that the attempt to evert it, in order to make topical applications to its inflamed conjunctival surface, is not only extremely painful, but frequently impossible. In such cases a few drops of a solution of nitrate of silver (10 grs. to 1 oz. water) may be dropped into the eye once or even three times a day. This should be preceded and followed by the use of a few drops of a solution of cocaine (2 or 4 grains to 1 oz. of water), and a minute or two later the eye should be carefully washed out with a very mild solution of common salt (2 or 3 grains to 1 oz. water).

Blenorrhœa neonatorum, or purulent conjunctivitis of the new-born.—A gonorrhœal or profuse leucorrhœal trouble of the mother having existed before the child's birth, the greatest care should be exercised to prevent an infection of the child's eye, by syringing the vagina with a mild solution of corrosive sublimate repeatedly during labor, by delivering as quickly as possible after the child's head entered the pelvis, and by dropping into the child's eyes (after cleansing them thoroughly) one or two drops of a solution of nitrate of silver (10 grains to 1 oz. water). This is known as Credé's method. In private practice the use of nitrate of silver is of course only called for if it is known that the mother has been diseased, or that during the labor some of the vaginal discharge accidentally got into the baby's eye. After treating the eye in this manner, cold compresses should be applied for ten minutes.

The milder form of the disease, which, as a rule, is more of the nature of a catarrh than a blenorrhœa of the conjunctiva, requires but little treatment. There is but little swelling of the lids and discharge is slight, the cornea not being affected at all. Washing and cleaning the eye with a tepid solution of boric acid (10 grains to 1 oz.) every two or three hours, will cure the disease. If it should prove to be a more obstinate case, a five- or ten-grain solution of nitrate of silver may be applied to the well everted lids; in many instances one or two applications of the nitrate

of silver will be all that is required in order to cure the case. Ice-cold applications are required in only very few of these cases.

A true blenorrhœic or purulent conjunctivitis requires, however, the most careful treatment. It is such a dangerous affection if neglected that any discharge of the eye of a very young baby should receive at once careful attention. On account of the little power of resistance of the cornea of such young children, serious complications of it occur frequently and often during the earliest stages of the disease, and at times in spite of the most careful treatment. Protection of the second eye, if both are not affected at the same time, becomes likewise a matter of great difficulty on account of the age and restlessness of the patient. It is therefore advisable to begin with iced compresses at once. In many cases they may be made for fifteen or thirty minutes every hour, night and day; in severe cases they have to be made constantly. Nitrate of silver must be used promptly and frequently in strong solutions or in the shape of the irrigated stick. We have to be guided in its uses more by the amount of the discharge and the thickness of the conjunctiva than by the swelling of the lids, for this is more readily controlled by the use of cold applications. The eye should be cleansed very carefully, rough handling being very injurious and painful. It is done easily by drawing up the upper lid and allowing the solution of boric acid

to drop into the eye from a small sponge or a pledget of absorbent cotton. If there is much discharge this has to be done every ten minutes; as a rule once in an hour is sufficient. Boric acid is superior for this purpose to a solution of corrosive sublimate, because the eyes have to be cleansed so frequently that even very weak solutions of it would irritate the eye too much. If the secretion is thick and adhering to the lids it may be carefully removed by means of a little absorbent cotton twisted around a wooden tooth-pick. The greatest care must be taken to evert the lids thoroughly. The child's head should be held between the physician's knees, the lids be everted, held in place with the left hand and the application be made with the right one. The lower lid is to be treated in the same way. If the secretion is muco-purulent it is well to remove the excess of the caustic and the coagulated discharge by means of tepid salt water. If the discharge is purulent it is not necessary to wash off the excess of nitrate of silver, especially if it was carefully applied by means of a small pledget of cotton to the well everted lid. Brushes should not be used at all to apply the nitrate of silver with, for it is more difficult to regulate the dose if astringent. It is well to use a little cocaine solution before and after making the application and immediately thereafter the iced compresses should be made and very frequently renewed for some time. One application a day is as a rule sufficient even in the severer cases; later on

or in milder cases the nitrate is to be used only once every second day.

A careful examination of the cornea should be made every day as long as the child's eyes remain closed. This may be very difficult, especially to inexperienced hands; it can be done by pressing the upper lid gently back and upwards, or by means of a lid-elevator. In the ratio that the severity of the inflammation subsides the duration of the cold applications and the strength of the nitrate of silver solution may be decreased.

As soon as the cornea becomes implicated the care and attention must be doubled. There is either a hazy condition of the cornea, or a small localized spot of infiltration, or a small marginal ulceration. The two former modes of invasion may be treated by dropping into the eye a few drops of a solution of sulphate of atropine (2 grains to one ounce of water) twice or three times a day. However, as soon as a break of continuity of the surface of the cornea shows itself, or in other words as soon as an ulcer forms, sulphate of eserine (one grain to one ounce of water) is to be used every three or six hours. It is advisable to use this remedy in severer cases even if there is no corneal complication on account of its tonic effect upon the conjunctival vessels. One or two drops are to be applied to the eye twice a day.

The prognosis of the disease depends upon the extent of the corneal complications. If there are none

a perfect cure is the rule; however, corneal ulcers will usually leave the eye more or less impaired.

If the corneal ulcer perforates the aqueous humor and sometimes even the crystalline lens escape through the opening and the iris, falling forward against the cornea, is apt to become firmly united with it at the place of the perforation and as the ulcer heals it remains frequently attached to the cornea at the place of the scar; a leucoma adherens will be the result. The lens, if it has not escaped from the eye at the time of the perforation, is liable to fall forward against the ulcerating cornea; when the anterior chamber forms again the aqueous humor replaces the lens and at times the iris. The lens capsule is, however apt to be stained from its contact with the ulcer and an anterior capsular or pyramidal cataract may form. At times a bulging of the cornea at the place of the ulceration will take place during the healing process and lead to the formation of a staphyloma of the cornea, or the remaining corneal tissue may undergo degenerative changes, and an atrophy of the cornea or the entire eye-ball may be the result. Simple stains of the cornea (*maculæ corneæ*) are, however, the most frequent sequel of the ulceration, especially if they did not lead to the perforation of the cornea. A drop of a solution of the sulphate of cadmium (two grains to one ounce of water) dropped into the eye once or twice a day will help greatly to clear up the opacities of the cornea if they are superficial.

In order to avoid contagion great care and cleanliness on the part of the nurses is necessary, and it should not be neglected to acquaint them with the dangers they are exposed to, if they are not very careful.

Gonorrhæal Conjunctivitis, or Ophthalmia.—The treatment of this formidable disease requires the greatest care on the part of the physician as well as the nurses; it requires two well-instructed nurses to attend to the patient; they have to take turns every few hours in order to be able to do full justice to the patient.

If it becomes evident that abortive treatment is of no avail, the first step *must* be to close the good eye hermetically. In order to give the patient a chance to see during the time the disease lasts, a watch-glass may be used for this purpose. It may be fastened to the orbital margin by means of strips of adhesive plaster, but a better plan is to fasten a small roll of absorbent cotton to the orbital margin by means of a collodion, placing the watch-glass on it, and fasten it to the cotton by means of another roll of cotton placed over its margin, and fastened to the lower layer by means of collodion. This is perhaps the safest dressing, for even if some of the discharge of the inflamed eye should run over the nose and get under the glass cover, it will be taken up by the absorbent cotton before it can reach the eye. The outer canthus is to be left free, in order to give ventilation

to the covered eye, and to keep the covering glass free from moisture, especially as there is no danger that any discharge may enter at this point.

Iced compresses have to be continued night and day as long as the swelling of the lids continues, and they have to be renewed frequently. The best material to be used for this purpose is absorbent cotton; according to the severity of the local heat and swelling, larger or smaller pledgets may be employed. After using them they are to be thrown away, or they may be cleaned in a weak solution of carbolic acid. The best material for cleansing the eye is a cold weak solution of common salt, or boric acid. Of topical applications nitrate of silver in the strength of 20 grains to 1 ounce of water is the best. It is not advisable to use it as long as the upper lid is so swollen and infiltrated that it cannot be everted, which is apt to be the case during the first two or three days of the disease.

During this stage it is necessary to keep the eye as clean as possible. It is claimed that hot water of 120° or 130° acts better in this stage. If the upper lid becomes a little softer to the touch, and the discharge more profuse and purulent, a solution of nitrate of silver (10 grs. to 1 oz.) may be dropped into the eye two or three times a day. Iodoform in very fine powder has been used, but its action is not so prompt as that of the nitrate of silver. As soon as the lid can be everted without giving the patient too

much pain, a stronger solution must be applied to the well-everted lids; in milder cases once, in severer ones twice a day. The direct contact of the nitrate and cornea should be avoided as much as possible.

The cornea must be carefully watched during the progress of the disease, and as soon as a marginal ulcer or a slight infiltration, which shows itself as a white spot, is noticed, atropine or eserine should be used. If the upper lid is so swollen and inflamed that it cannot be readily everted, it must press greatly upon the cornea, and thus is a constant source of danger to it. By a free division of the outer canthus by means of a scalpel great relief is obtained at once; the lid is no longer drawn tightly over the cornea, and it can be more readily everted.

The loss of blood during the operation can only be of benefit to the engorged conjunctival vessels. The cornea will, as a rule, suffer at the periphery, and in these cases the use of eserine is indicated; if there is a central ulceration, atropine may be used instead, especially if a perforation of the cornea is threatened. In many instances the cornea may be saved, or be at least only partly damaged, and the eye may escape with useful vision; but frequently the ulcerative action will spread in spite of our precautions, until the greatest portion of the cornea is destroyed. The membrane of Descemet, being much harder than the corneal tissue proper, is apt to resist much longer.

At times it may remain intact, and in such a case

the appearance of the eye will ultimately be much better than in those cases where this portion of the cornea likewise breaks down.

In such a case a staphyloma is likely to form, but even if this does not take place, the eye will be badly disfigured, and is liable to shrink.

Ice-compresses should be used faithfully until the eye remains free from discharge. As soon as an ulcer of the cornea makes its appearance, disinfection of the eye and destruction of the microbes in the corneal wound becomes more imperative than it was before. For this purpose a solution of the bichloride of mercury, 1 to 5,000, or even 1 to 3,000 parts of water may be used freely, unless it should irritate the eye too much. Corneal ulcers may be cleansed with a ten-per-cent. solution of peroxide of hydrogen; but this preparation is not easily obtained in a pure state. A solution of permanganate of potash (1 gr. to 1 oz. of water) answers well for this purpose; but if the eye is very irritable, nothing will answer as well as a weak solution of common salt or of the boric acid; and as these can be used more freely than the other remedies they are, as a rule, just as efficient. The action of eserine is, as a rule, very beneficial upon the engorged conjunctival vessels as well as upon the nutrition of the cornea, but its use is apt to be followed by a sharp pain, lasting from five to thirty minutes. In order to avoid this, enough cocaine may be added to prevent the pain. My usual prescription for this purpose is:

R Cocaine muriatici, gr. vj.
Eserini sulphurici, gr. j.
Aquæ distillatæ, ℥ j.

M. S. Two drops in the eye every three hours.

If atropine is used it is not necessary to add any cocaine:

R Atropiæ sulphatis, gr. i.
Aquæ, ℥ ss.

M. S. Two drops in the eye three times a day.

After a week or two the discharge from the eye become less, the redness of the conjunctiva is less marked and the blood-vessels are less prominent; the white sclera may be seen through the inflamed conjunctiva and the patient is able to open the eye. If the cornea had not become involved by this time, there is very little danger that this will take place now; as the act of opening the eye, does not only take off the pressure of the lid on the cornea, but it gives the secretion an opportunity to flow from the eye; the patient should therefore be encouraged to open the eye as much and as early during the disease as possible, even if there is a slight lesion of the cornea; the only indication against it being a large slough of this organ, when the eye has to be kept as quiet as possible. During the latter stages of the disease, the eye is to be cleansed with a solution of boric acid (15 grs. to 1 oz. of water). If the eye remains tender and irritable, the addition of one ounce of cherry-laural water to seven ounces of the boric acid solution will prove

very grateful. If the cherry-laural water is not to be had, a little cocaine will do instead. The solution of eserine, mentioned before, should be continued up to this stage; and if there has been much loss of corneal tissue, it must be continued for several weeks, one or two drops to be dropped into the eye twice or three times a day, as by its use the tendency to the formation of a staphyloma is greatly diminished.

The use of the electro- or actual cautery in corneal ulcers of this kind has been of little use, because there is so much infectious material constantly in the eye that the sterilizing of the ulcer by the cautery becomes of little value.

Croupous or Membraneous Conjunctivitis requires different treatment from the very beginning, if it affects weakly, strumous children, which it is apt to do. In these cases nitrate of silver should not be used at all, or perhaps only in the later stage of the disease, and then only in a one-per-cent. solution applied to the folds of transmissio once a day, and very sparingly at this. Ice compresses are to be used only for fifteen minutes every hour or two, but the eyes should be cleaned very carefully with a lukewarm solution of boric acid (10 grs. to 1 oz. of water), at least once every hour. The yellow oxide of mercury, one or two grains to one drachm of pure vaseline may be used. It should be applied by means of a probe or camel's-hair pencil to the conjunctiva once or twice a day. By rubbing the lids gently after its introduction it is

to be scattered over the entire conjunctival surface. Corneal complications should be treated with atropine.

Hygienic and dietetic measures are of the utmost importance. Dark and badly ventilated bedrooms should not be tolerated; irregularity in eating is very bad, and meat should be given freely. Quinine in small doses taken shortly before meals will be of great service, and likewise the mixture rhei and sodæ:

℞ Extracti rhei fluidi.
Sodæ bicarbonatis, āā 3 ij.
Ess menthæ piperitæ.
Ess. Zingiberis, āā 3 j.
Aquæ, ℥ iv.

M. S. The dose is from one to two teaspoonfuls three times a day, according to the age of the child.

The membranous variety, which is met with at times as a form of acute purulent conjunctivitis, requires but little change in the treatment of this affection, except that, as a rule, the appearance of membrane is a counter-indication to the use of strong caustic applications.

Diphtheritic conjunctivitis.—The true or virulent form of the disease is so apt to lead to the destruction of the eye, or the cornea at least, that it appears to be of little value what remedies are used. On account of the great intensity of the congestion accompanying it, which causes an almost complete stasis of the circulation and great hardness of the lids, the use of either very cold or hot applications is called for

and the latter are perhaps preferable. The cleansing of the lids and eye is to be done very carefully as the parts are very apt to bleed. To the inflamed conjunctiva iodoform in very fine powder may be applied twice or three times a day, or the yellow oxide of mercury ointment is to be put into the eye once or twice a day. A weak solution of eserine and cocaine may be used from the beginning twice or three times a day. Excoriations of the lids are to be treated with the yellow oxide of mercury ointment, applying it twice a day and cleaning it carefully each time before another application is made.

Quinine and iron should be given from the very beginning and be preceded by a mild cathartic, if there is no indication against its use.

As soon as the discharge becomes profuse and purulent the use of strong solutions of nitrate of silver is advisable, a 4- or 5-per-cent. solution should be applied very carefully to the everted lids.

Corneal complications may be treated either with atropine or eserine according to the amount of relief of pain they will give; but eserine is preferable if its use does not cause too much pain.

TREATMENT OF GRANULAR LIDS.

This disease presents itself in so many different forms that we have no one remedy that will answer in all cases, although the carefully regulated use of nitrate of silver will always be of great value.

Acutely inflamed granular lids, whether they are the result of recent infection, or whether they are acute exacerbations of old chronic cases, must be treated with cold compresses and complete rest of the eye, especially if the cornea is implicated. Ulcerations of the cornea, which are apt to accompany such attacks require the use of atropine. Astringent applications must not be made until the pain and photophobia subside, which may be in two or three days after the attack. After this time the well-everted lid should be carefully touched at the folds of trans-
mission with a twenty grain solution of nitrate of silver by means of a very small piece of cotton twisted around a probe. If a brush is used the quantity of the astringent solution is apt to be too large and it will be safer to use only a solution of 10 grains of silver to one ounce of water. In the beginning it is well to wash off the excess of silver with a weak solution of common salt, later and especially if the application is made with a pledget of cotton, this is not necessary. A weak solution of eserine (one grain to one ounce) is now to be used in the place of the atro-

pine and after all signs of irritation have subsided the case is to be treated like a chronic case.

It must not be forgotten that the disease is especially contagious and dangerous during the acutely inflamed state, and the greatest care should be exercised to prevent attendants and other inmates of the house or home from becoming infected. Strict isolation is therefore necessary if such cases occur in crowded institutions, and it will be well to remove such patients to separate tents in summer and special hospitals in winter.

Debilitated children require tonics such as iron and quinine, and in asylum children a complete change of diet and general surroundings will be of great service.

The chronic blennorrhæic form which we are so apt to meet as a sequel to acute purulent inflammations, is to be treated with a pretty strong solution of nitrate of silver (15 grs. to 1 oz. of water), applied to the fleshy looking lids, the upper as well as the lower, once a day, or once in two days if the conjunctiva is not so much thickened. This is to be continued as long as there is a discharge, later the use of alum crystals or of the mitigated stick of the sulphate of copper is to be substituted. In most of these cases the conjunctiva is very irritable, and atropine, especially the continued use of it, is apt to add greatly to the trouble, and not unfrequently relapses of a semi-acute nature, extending even to the skin of the eye-

lids and the face, are due to the action of this drug. It is for this reason that eserine should be used instead; but it must be employed in very weak solutions, as it might lead to the formation of posterior synechia if used too strong.

The follicular variety, which is marked by sago-like bodies, frequently arranged in rows like strings of pearls and not accompanied by any marked inflammation of the conjunctiva, is not only slow in its development, but is likewise slow and tardy to yield to treatment. Cases of this kind may remain under observation for years, especially if the patients are irregular in their attendance or if the hygienic surroundings are not very favorable. However, this form is usually not dangerous to the cornea, and unless special irritation should bring on an acute attack of conjunctivitis, they will gradually disappear even without treatment.

Of all local applications, the use of a strong solution of silver (15 to 20 grs. to 1 oz. of water) is undoubtedly the best. Care must be exercised that the application is confined to the upper and lower cul-de-sac; especially the upper fold of transmission must be touched with it as far up as is possible. The silver should not touch the cornea nor the free edge of the lid; it should be used once every day until the bodies have become much smaller, when it may be used only once every second or third day.

Good hygienic surroundings are, however, in this

form, as well as in true granular lids, of the utmost importance, and cases of this kind will get well if the patients are removed from objectionable surroundings or are only treated to a complete change of air, which before continued to grow worse or linger on under the most careful and persistent treatment. This disease resembles in many respects manifestations of a strumous diathesis, for it is apt to show itself during childhood; like it, it will improve under good hygienic and dietetic rules, and disappear more or less completely at the age of puberty. This is, however, not always the case, and the disease may make its appearance in adult life. A generous meat diet seems to be the best in such cases; the free use of farinaceous food or sugar is, however, to be avoided. Plenty of fresh air and out-door exercise must be furnished; however, the patient should be well protected against climatic changes, and especially the feet should be kept dry and warm. The use of water to dress the hair with, especially before going out-doors, is so often followed by slight general colds and increase in the conjunctival irritation, that it should not be allowed, unless the hair and the head is rubbed thoroughly dry before the patient leaves the house.

True granular lids in their first stage of development, especially if not accompanied by much irritation of the eye, are not apt to come under the care or observation of the physician. The subacute variety resembles an ordinary catarrh of the conjunctiva, and

as there is not much discharge, it is sometimes mistaken for it. Its treatment at this stage varies but little from that of an ordinary conjunctivitis but as soon as small whitish bodies are observed, which are formed by the accumulations of lymph cells, a more vigorous treatment becomes necessary. The use of a ten-grain solution of nitrate of silver is now indicated, and it should be used every day or at least every second day. The use of the eyes for small objects, as well as for reading and writing should be forbidden, especially in artificial light. The patient should wear dark glasses if exposed to bright light, and wine as well as beer should not be used by him.

Granular lids once well established can only be cured by faithful attention on the part of the physician and patient. No desultory treatment can do any good, and if possible, the physician should have complete control over the patient. All injurious influences, such as bad air during the day or night, tobacco smoke, dust, or great atmospheric moisture, close application of the eyes, the irritating effect of the use of alcoholic stimulants, and exposure to bright light, are to be avoided. In making local applications to the lids, especially to the upper one, they should be thoroughly everted, and the patient be directed to look toward the ground, so that the entire upper portion of the conjunctiva is exposed to view, because it is here where the applications will do most

good. However, in children and very young persons the lower cul-de-sac is, as a rule, the principal seat of the granulations, and the upper one may escape entirely, or be but slightly affected. In such cases the application may be made to the lower lid, which is a much easier undertaking, for in nervous children it is sometimes difficult to make them submit to an eversion of the upper lid.

In regard to the remedy best suited to the case, the following rules may guide us : If there is any purulent discharge, so that the lids of the patient are glued together when he awakes in the morning, or if the purulent matter is found on the eye-lashes, or in the cul-de-sac on everting the lids, *nitrate of silver* should be used. If there is no discharge, except a little lachrymation, and the conjunctiva is red and hypertrophied, *sulphate of copper* is to be employed. If the eye is unusually dry, and the conjunctiva changed into cicatricial tissue, milder applications, such as alum, or boroglycerite, or balsam of copaiba are indicated. Participation of the cornea, as long as there are only a few blood-vessels extending over and into the corneal epithelium, does not require a change of treatment, but a weak solution of eserine may be used to great advantage, one drop to be put into the eye morning and evening. If the vascularity of the cornea is marked, there is apt to be more or less discharge, pain and photophobia, and nitrate of silver and eserine will have to be used

—carefully but energetically. Ulcerations of the cornea are to be treated with hot compresses applied morning and evening, and, according to the feeling of the patient, atropine or eserine is to be instilled into the eye immediately afterwards. Nitrate of silver is to be used daily in solutions strong enough to affect the granulations, but they must not irritate the eye too much, nor must they give rise to much pain. If there is a dense pannus over the cornea, the conjunctiva decidedly hypertrophied and granular, and if there is, at the same time, no purulent discharge, jequirity is the best remedy.

If there is *any kind of pannus* and tightening of the palpebral fissure, so that the upper lid is not only drawn tightly over the cornea, but at the same time difficult to evert, a division of the outer canthus should be made without delay, for if this condition exists for any length of time, the cornea is apt to become permanently damaged. The operation itself is simple, but painful, and an anæsthetic will have to be administered. After dividing the outer canthus by means of a strong pair of scissors, as far back as the bony margin of the orbit will permit, the upper lid is to be lifted up and the point of the closed scissors is to be inserted into the cut surface between the skin and the conjunctiva, where the fibres of the upper canthal ligament can be distinctly felt; these are now to be divided.

The same mode of operation applies for the lower

lid. After waiting until the hæmorrhage has ceased, the conjunctiva is now stitched to the enlarged opening by means of three sutures; one being in the centre, one in the upper, and one in the lower part of the wound. After cleaning the parts carefully, a tight bandage is drawn over the wound, which is previously dressed with a soft piece of linen and vaseline, and with a liberal pledget of cotton over this. The bandage is to be kept on for at least one day, and the stitches may be removed on the second or third day. The relief of the cornea and the ease with which the upper lid can be turned after the operation is striking.

In regard to the use of nitrate of silver for granular lids, the following precautions are to be observed: If its use is followed by great pain in the eye, lasting for hours or even days, it must be discontinued or the strength of the solution must be diminished. Never should an application be made if the eye is still painful from the preceding one. If its use is followed by an unpleasant gritty sensation, the superfluous portion of it should be removed by the use of a weak solution of common salt immediately after the application is made. A rough feeling is at times produced by the coagulated mucus and albumen of the discharge, and this should be removed from the eye by means of small pledgets of cotton or by a solution of salt. If its use is continued for a long time dark staining of the conjunctival tissue is apt to follow (argirosis), or

fine corneal opacities are apt to form, especially if there was pannus at the same time. If continued for too long a period its application becomes less efficient. In fact, it is of the greatest help in the treatment of these tedious affections to change occasionally the remedies employed. Obstinate cases will improve at times rapidly if the nitrate is used one day and the sulphate of copper the next. The pain caused by these applications varies considerably in different patients. Some will be able to leave the office right after a liberal application of the caustic has been made; others will suffer intensely for hours, and in some it becomes necessary to use cold-water compresses in order to ease the pain caused by its use. Of the greatest help in this respect is the hydrochlorate of cocaine; a few drops of a two-per-cent. solution dropped into the eye a few minutes before and after the application is made will do a great deal to reconcile the patient with our treatment.

The application of the silver, as well as that of all powerful astringents, should be confined entirely to the fold of transmission, for the reason that they may lead to cicatrizations of the parts; a danger already great enough as a sequel of the granulation. Sulphate of copper is to be used by rubbing a smooth crystal of the drug gently over the fold of transmission. Pressure or rough handling should be avoided; the amount of effect is regulated by the time the agent remains in contact with the conjunctiva, and not by the

pressure exerted. It is well to touch even the highest portion of the fornix, by carrying the crystal of copper even under the edge of the well-everted lid in those cases where the upper cul-de-sac is so large that it cannot be thoroughly exposed. The pain following the use of copper is often as great as that caused by nitrate of silver, and it may become necessary to wash the parts after its use.

If the application of these remedies is followed by swelling of the lids, or if the eye is very sensitive, tannin may be used as an astringent. If the conjunctiva is thickened, it may be used in the form of a fine powder, which is to be dusted over the everted lids; but, if there is marked cicatrization, or if there are numerous small granules with an almost normal conjunctiva, a solution of tannin (20 to 30 grs. to 1 oz. of glycerin) is to be used by means of a brush.

A very useful remedy in those cases which are accompanied by marked congestion of the ocular as well as the palpebral conjunctiva, lachrymation and photophobia is boric acid, in powder, dusted into the eye quite freely, or boro-glycerite, applied to the everted lids, once a day.

In very indolent cases, as they are especially apt to occur in asylums or schools, the use of a preparation composed of one drachm of balsam copaiba to seven drachms of vaseline, applied daily to the conjunctival sac by means of a probe, will be very useful.

Unusually large masses of granulations may ap-

pear as heavy folds or small tumors, extending in some instances from the fornix over the eyeball, and which can be easily exposed to view by lifting up the upper lid, and may be removed with scissors. Others that project over the conjunctival surface like small isolated tumors, may be treated by squeezing out their contents, or they may be destroyed by the aid of the actual cautery or by means of electrolysis. For this purpose a sponge connected with the positive pole of a strong battery is placed on the forehead, and after the eye has been thoroughly cocainized, a needle, connected with the other pole, is passed through the mass and kept there for a short time. Smaller accumulations of this kind disappear after one application, larger ones have to be treated until they are cured. Electro-cautery may be used for the same purpose.

Complications of granular lids are those affecting the cornea, *pannus* and *ulcers*; those of the lids, *trichiasis* and *entropium*; of the tear-sac, *dacryocystoblenorrhæa* and of the iris, *iritis*.

Pannus varies considerably; a few blood-vessels may be seen to be running into the corneal epithelium or the entire cornea may be changed into a semi-opaque or even fleshy mass. In the first place there is little impairment of sight; in the latter there is apt to be total blindness. A slight vascularity of the cornea is frequently met with and does not as a rule require special treatment, it is apt to disappear after the use of silver or copper, and the use of eserine is

apt to favor its cure. A greater amount of vascularity is usually associated with marked disturbance of vision. Great relief is frequently obtained by the use of atropine. This should not be continued for any length of time, especially not in adults, as it might bring on glaucoma. It should be followed by the use of eserine, or this may be used alternately with the atropine. If the lids are drawn tightly over the cornea, a canthoplastic operation is called for. Sometimes granular bodies may be seen on the margin of the cornea, and at times they appear on the cornea itself. In such a case the topic applications may be extended so as to include these bodies. If in spite of this treatment the cornea does not clear up jequirity may be employed. This remedy is very dangerous to a clear cornea, but it is very useful in these cases. The remedy is to be used in the following manner: The beans are to be crushed and macerated (one bean to one ounce of water); the infusion is allowed to stand in a moderately warm place for several hours, and is now, after straining it through a piece of linen, used as a wash, or it is brushed on the conjunctiva once a day. A pretty smart semi-membranous inflammation will be set up after one or more applications; during this time the patient is to be kept quiet and the inflammation is to be watched so that it will not affect the cornea, for it may be the cause of extensive ulcerations of this organ and its use may lead to a total destruction of the eye. An

infusion containing two or three per cent. or more of the jequirity bean is quite powerful and a stronger one is undoubtedly dangerous. The infusion should be made fresh whenever it is used. The jequirity may be kept in a state of fine powder mixed with equal parts of sugar of milk. It may be used in this state, but it is better to moisten it with a few drops of warm water on a saucer; after allowing it to macerate for ten minutes it will be ready for use. Inoculation with gonorrhœal pus for the cure of dense pannus is too dangerous to be recommended. If the cornea becomes very vascular and thin at the same time, with a tendency to bulge forward, eserine and the use of a firm compress bandage over the eyes is indicated. The bandage should only be used in those cases where there is no discharge from the eye, and it should be renewed at least twice a day.

Ulcerations of the cornea complicating pannus require the use of atropine or eserine and if they do not heal very readily, they should be treated by actual or galvano-cautery; this is far superior to touching the ulcers with nitrate of silver or strong solutions of carbolic acid.

Great vascularity of the cornea, known as fleshy pannus, may require the removal of a strip of conjunctiva near the cornea (peritomy); in this manner the vessels are destroyed and their corneal portion disappears.

Iritis may be met with as a sequel to deep seated

corneal ulcers. Atropine is the proper remedy for it, and leeches to the temples if the pain is great. Eserine must not be used if iritis exists; but the disease may be difficult to diagnose for the cornea may be so little transparent that the iris is not visible.

Inflammation of the tear-sac is not often seen as a complication of granular lids, but it has at times been observed after the use of jequirity infusions. The use of lachrymal probes is necessary for its cure.

Entropion, which will sometimes be seen as the result of granular lids, requires an operation for its relief and so does trichiasis. If there are only a few lashes turning in they may be destroyed by means of electrolysis.

The contagious nature of granulated lids must, however, never be lost sight of, and if the disease makes its appearance in localities where many persons are constantly crowded together, in barracks or asylums, for instance, the greatest care must be exercised to prevent it from spreading to the other inmates. To be sure, we see sometimes one eye of a person suffer for years with the most marked granulated lids, and none of the family, nay, not even his other eye become affected; but on the other hand, we see and read daily of instances where hundreds of eyes fall as victims to the disease.

As soon as the disease is diagnosed in one of the inmates of such institutions, the patient should be separated from the rest, either by removing him from the

place altogether, or by isolating him. If it happens during the summer, the patient should be placed in a tent; if it is in winter, a room should be set apart for him, to which nobody except the nurse and the physician are admitted. If a larger number of the inmates are affected in this manner, they should all be kept separate from the unaffected ones; if it is possible, they should live in a separate building. They are to be under the care of experts in the treatment of this affection; nor should they be allowed to return to the healthy section or to their families until one thoroughly conversant with the disease has pronounced the case cured. If the patient cannot be constantly treated by an expert, he should be watched and seen by one at least once a week in order to see what progress the patient has made, or whatever change of treatment is needed. The patients should not only receive the proper medical treatment; their surroundings should be made as healthy as possible; plenty of fresh air, protection against taking cold, and a generous diet, especially enough and good meat, will serve to bring on a rapid cure.

As the progress of granulated lids is slow and insidious, the existence of the disease may escape detection during its earlier stages, and many eyes may have become infected before a single case of the trouble is discovered, and an institution that justly boasted of the health of its inmates, may suddenly be plunged into a dangerous epidemic of granulated

lids or contagious ophthalmia, during which many eyes may be lost.

In order to prevent such calamities, an examination of the eyes of all the inmates should be made at regular intervals by a competent physician, and certain rules in regard to the mode of living of the inmates should be carefully observed. The most important of these are: Never to admit a child or adult to the institution unless the healthy condition of the conjunctiva is known. If persons with contagious diseases of the eye have to be admitted, they should be kept isolated from the rest until their disease has been cured. This is of the greatest importance, for once infected, it may take years, in spite of the greatest care, before the institution is freed from this dreadful affliction. The use of one large towel for a number of the inmates should not be tolerated under any circumstances. Each inmate should have a separate towel and handkerchief for his own use, just as he has his own coat and pants. The sleeping apartments should be large and well ventilated, each inmate having his or her own bed, separated from that of the neighbor by at least two feet, and likewise his own basin for washing. Where running water can be had for washing purposes, it is even better. School as well as working rooms should not be over-crowded, and should be well ventilated. The meals of the inmates should be such that enough variety exists; especially a good supply of meat is needed by chil-

dren. Regularity of meals is desirable. If any way possible, certain portions of the buildings should be left vacant for some time and thoroughly cleaned and whitewashed, so as to destroy as many of the microbes, that may infect the rooms, as possible; for in spite of the greatest cleanliness, crowded institutions have a peculiar odor, that cannot be healthy, and that cannot be easily removed, except by closing them up entirely or in part for some time.

Sanitary arrangements, especially the plumbing, must be perfect in every respect, for although miasmatic infection through bad air will probably never give rise to granulated lids, it is surely predisposing the inmates to its attack, for it lowers the power of resistance of the affected tissues.



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